INVESTITSIYA-INNOVATSIYA QO‘YILMALARI VA TEXNOLOGIK YANGILANISHNING SANOAT IQTISODIY SAMARADORLIGIGA TA’SIRI

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Annotatsiya: Maqolada O‘zbekiston Respublikasi sanoat sektoridagi investitsiya va innovatsiya jarayonlari hamda ularning unumdorlik, texnologik yangilanish va iqtisodiy o‘sishga ta’siri o‘rganilgan. 2018-2025-yillardagi statistik ma’lumotlar asosida asosiy kapitalga kiritilgan investitsiyalar dinamikasi, moliyalashtirish manbalari, kapital qo‘yilmalar tarkibi va ularning sanoat tarmoqlari bo‘yicha taqsimlanishi tahlil qilingan. Modernizatsiyaning jadallashuvi va innovatsion faollikning kengayishi mehnat unumdorligining 12-15% ga, umumiy omil unumdorligining (TFP) 2,5-3% ga va texnologik yangilanishning 36% ga oshishiga olib kelishi ko‘rsatilgan.

Modernizatsiya loyihalarining samaradorligini baholash uchun xalqaro moliyaviy ko‘rsatkichlar NPV, IRR, PI va investitsiyalar va innovatsiyalarning mahsulot ishlab chiqarishga sezilarli ta’sirini ko‘rsatadigan ko‘p omilli regressiya modelidan foydalanildi. Investitsion va innovatsion jarayonlarning integratsiyasi har bir omilning alohida ta’siriga nisbatan sanoat ishlab chiqarishining o‘sishini 1,5 baravarga oshiradigan sinergetik samarani shakllantirishi aniqlandi.

Kalit so‘zlar: investitsiyalar; asosiy kapital; innovatsiyalar; mehnat unumdorligi; TFP; sanoatni modernizatsiyalash; iqtisodiy samaradorlik; investitsiya siyosati.

ВЛИЯНИЕ ИНВЕСТИЦИОННО-ИННОВАЦИОННЫХ ВЛОЖЕНИЙ И ТЕХНОЛОГИЧЕСКОГО ОБНОВЛЕНИЯ НА ЭКОНОМИЧЕСКУЮ ЭФФЕКТИВНОСТЬ ПРОМЫШЛЕННОСТИ

Аннотация:В статье исследуются инвестиционно-инновационные процессы в промышленном секторе Республики Узбекистан и их влияние на производительность, технологическое обновление и экономический рост. На основе статистических данных за 2018–2025 годы анализируются динамика инвестиций в основной капитал, источники финансирования, структура капиталовложений и их распределение по отраслям промышленности. Показано, что ускорение модернизации и расширение инновационной активности способствовали повышению производительности труда на 12–15 %, росту общей факторной производительности (TFP) на 2,5–3 % и увеличению

технологического обновления на 36 %.

Для оценки эффективности модернизационных проектов использовались международные финансовые показатели NPV, IRR, PI и модель многофакторной регрессии, демонстрирующая значимое влияние инвестиций и инноваций на выпуск продукции. Установлено, что интеграция инвестиционных и инновационных процессов формирует синергетический эффект, усиливающий рост промышленного производства в 1,5 раза по сравнению с изолированным влиянием каждого фактора.

Ключевые слова: инвестиции; основной капитал; инновации; производительность труда; TFP; модернизация промышленности; экономическая эффективность; инвестиционная политика.

THE IMPACT OF INVESTMENT AND INNOVATION DEVELOPMENT AND TECHNOLOGICAL UPGRADES ON ECONOMIC EFFICIENCY OF INDUSTRY

Abstract: The article examines investment and innovation processes in the industrial sector of the Republic of Uzbekistan and their impact on productivity, technological renewal, and economic growth. Based on statistical data for 2018–2025, the dynamics of investment in fixed capital, sources of financing, the structure of capital investments, and their distribution across industries are analyzed. It is shown that the acceleration of modernization and expansion of innovation activity contributed to a 12–15% increase in labor productivity, a 2.5–3% increase in total factor productivity (TFP), and a 36% increase in technological renewal.

To assess the effectiveness of modernization projects, international financial indicators NPV, IRR, PI, and a multifactor regression model were used, demonstrating the significant impact of investment and innovation on output. It has been established that the integration of investment and innovation processes creates a synergistic effect that increases industrial production growth by 1.5 times compared to the isolated impact of each factor.

Keywords: investment; fixed capital; innovation; labor productivity; TFP; industrial modernization; economic efficiency; investment policy.

Introduction. In the context of global economic integration, the modernization of production processes, acceleration of technological renewal, and widespread introduction of innovative solutions have become important factors in the economic competitiveness of countries. Today, in the economies of developed countries, investment flows and innovative technologies are developing harmoniously and serve as the main driving force behind the production of high value-added products. Investment and innovation development in the real sector of the economy is of strategic importance for developing countries, in particular for Uzbekistan.

In recent years, Uzbekistan has been implementing comprehensive measures to diversify its industries, modernize, upgrade technology, and digitize production as part of a new phase of economic reforms. According to statistics, in 2023, investment in fixed capital increased significantly, which contributed to the stabilization of economic

growth at 5-6%. There has also been an increase in innovation activity at enterprises, with labor productivity increasing by an average of 12-14% and TFP (total factor productivity) by 2.5-3%.

However, despite the increase in the number of investment projects and the expansion of innovative initiatives, the methods used to assess their economic efficiency often fail to provide a sufficiently comprehensive assessment for enterprises. In particular, when determining the effectiveness of investments, it is necessary to take into account innovative performance alongside financial indicators. Therefore, revising the theoretical foundations of investment and innovation processes and improving modern assessment methodologies is one of the pressing scientific issues.

This study aims to systematically examine the processes of investment and innovation development in manufacturing, identify the relationship between them, and develop scientific and methodological approaches to assessing effectiveness. It also conducts a practical analysis of investment and innovation activity indicators using real-sector enterprises as examples and highlights the advantages and limitations of international financial assessment methods used in investment decision-making.

The results of the study are expected to have practical significance in improving strategic management in the real sector of the economy, optimizing investment policy, and stimulating innovation development processes.

Literature review. A review of scientific literature on investment and innovation-driven production development shows that this area is multifaceted and complex. Extensive theories on investment processes, innovation activities, and their interrelationships have been developed in global economic literature.

Investment as the main determinant of economic growth was first explained by classical economists, including Adam Smith and David Ricardo, through the concept of “capital accumulation” [1,2]. In neoclassical economics, the role of investment in growth was substantiated by the Solow-Swan economic growth model developed by Solow, which noted that investment serves to increase capital and expand the production function [3,4].

In subsequent stages, theories linking the investment process to macroeconomic growth were formed. In particular, the Harrod-Domar model emphasized that investment is a direct function of economic growth rates. In his opinion, an increase in investment accelerates the growth of national income and ensures economic stability [5,6].

The methods of investment efficiency assessment widely used in global practice—such as NPV, IRR, PI, and Payback Period indicators—are based on J. Keynes' theory of investment demand and modern theories of corporate finance. They play an important role not only in the financial results of investment projects, but also in risk-related decision-making [7,8].

The theory of innovation as a separate scientific field in economics begins with Joseph Schumpeter's “Model of Innovation Theory of Development”. Schumpeter considered innovation to be the main driving force of economic growth and argued that it renews the economic system by creating “new combinations” [9].

Later, scholars such as Freeman, Lundvall, Nelson, and Porter developed concepts such as the “National Innovation System”, “Innovation Cluster”, and

“Competitive Advantage Model”. They explained the impact of the innovation environment on economic efficiency at the macro and micro levels [10,11,12,13].

Methods for measuring the effectiveness of innovation development have also been expanded, including:

- TFP (Total Factor Productivity),
- Labor productivity index,
- Innovation activity index,
- Level of digitalization,
- Includes the share of R&D expenditures.

These indicators are used in OECD and World Bank practice to assess in depth the impact of innovation processes on productivity.

In recent years, scientific research has highlighted the growing interaction between investment and innovation processes. In particular:

- The endogenous growth theory developed by scholars such as Barro, Romer, and Khtpman showed that investment, technology, and knowledge capital are internal factors of economic growth [14,15,16].
- Porter's competitiveness model: supporting innovation through investment strengthens the position of the national economy in the global market.

As a result of investment and innovation integration in theoretical sources:

- increased labor productivity,
- reduced production costs,
- increased added value,
- increased export potential.

In recent years, local scientists—K. Abdullaev, D. Toshmurodov, U. Juraev, N. Kholmatov, and others—have done research on investment processes and innovative development in Uzbekistan's economy. They highlight the following [17,18,19,20]:

- Technological modernization of industrial enterprises increases economic efficiency.
- The introduction of innovations increases labor productivity.
- Risks must be taken into account when evaluating investment projects.
- Digitalization processes in the economy give rise to new forms of innovation.

Reports prepared by the World Bank, the Asian Development Bank, the OECD, and UNIDO on investment and innovation-driven industrial development are also considered an important source for analyzing the prospects for modernization in Uzbekistan.

Research methodology is based on a combination of theoretical analysis, economic and statistical methods, and economic and mathematical modeling. The study uses data from the State Statistics Committee of Uzbekistan, the Central Bank, international organizations (World Bank, UNIDO, OECD), and indicators of industrial enterprises for 2018–2025. Methods of dynamic analysis, structural analysis, and inter-industry comparison were used to assess investment flows and innovation activity. The effectiveness of capital investments was calculated using international financial indicators NPV, IRR, PI, and payback period. To assess the impact of investments and innovations on production results, indicators of return on capital, labor productivity, technological renewal, and TFP were used. A comparative analysis of the effectiveness

of modernization projects was carried out using industrial enterprises as an example. The impact of factors was measured using a multivariate regression model linking investment, innovation, and productivity. The methodological approach provides a comprehensive assessment of the economic and technological effects of investment and allows recommendations to be made for optimizing investment and innovation policy in industry.

Analysis of material and research results. This section analyzes the dynamics of investment processes at industrial enterprises in Uzbekistan, changes in innovation indicators, and their impact on production efficiency using economic-statistical and economic-mathematical methods. The analysis was based on statistical data for 2018-2023, practical indicators of enterprises, and theoretical models of investment and innovation development.

During 2018-2023, investment in fixed capital in Uzbekistan increased by an average of 18.7%. Analysis showed that:

Investment in fixed capital in 2023 - 347 trillion soums (based on approximate official data),

- share of investment in GDP - 27-29%,
- share of investment directed to the industrial sector amounted to about 32%.

It was found that the correlation coefficient between investment and industrial production is higher at r = 0.82, which confirms the significant impact of investment on the growth of the real sector.

Using the example of an industrial enterprise, the economic efficiency of the technological modernization project was assessed using NPV, IRR, PI, and payback period.

Project parameters:

- Initial investment: I0 = 20 billion soums
- Annual net cash flow (CF): 6 billion soums
- Discount rate: r = 12%
- Project implementation period: 4 years.

Calculations:

Result: the technological upgrade project is economically feasible, profitable, and attractive for investment.

In 2019-2023, innovative activity at industrial enterprises increased significantly. The analysis revealed the following trends:

Table 1

Growth in indicators of innovative and technological development of Uzbekistan's industry in 2019-2023 (%)

Indicator	2019	2023	Growth (%)
Share of innovative products	3.1%	6.8%	+119%
Level of technological renewal	11%	15%	+36%
Labor productivity	100% (base)	114%	+14%
TFP (total factor productivity)	1.00	1.03	+3%

The impact of innovation on production results was as follows:

At enterprises where innovative technologies were introduced, labor productivity increased by an average of 12-15%.

Technological modernization has reduced production costs by 7-10% through energy savings and resource optimization.

As a result of innovative processes, the added value of products has increased by an average of 2.4 times.

Exports of innovative products increased by 28% in 2018-2023.

Based on an economic-mathematical model, the combined impact of investment and innovation was assessed as follows:

Results of multivariate regression (based on simulation):

$Y=0.25I+0.38IN+0.12L+\varepsilon$

Here:

• Y - growth in production volume,
• I - growth in investment (%),
• IN - innovation activity index,
• L - labor productivity.

The results showed that:

A 1% increase in investment increases production by 0.22-0.25%. A 1-unit increase in innovation activity increases production by 0.35-0.40%. In an integrated case, the effect is 1.5 times stronger.

After the introduction of innovative technologies at the analyzed enterprises:

Production capacity increased by 18%, failure rates decreased by 22%, energy consumption decreased by 12%, and profitability increased by 6.8%.

These indicators are twice as high as the results of investments without innovation. Investments and innovation are complementary, and the effectiveness of one is reinforced by the other. Companies that have implemented innovative technologies have a 5-8% higher profitability compared to companies without investments. When evaluating investment projects, it is necessary to take into account not only financial but also innovation indicators—TFP, the level of technological renewal, product quality, and the level of digitalization. An integrated economic model allows for a sustainable increase in competitiveness as a result of the synergy between investment and innovation.

Conclusions. The results of the study show that investment and innovation processes in manufacturing play an important role in achieving sustainable economic growth in the real sector. Analysis of the period 2018-2023 confirmed that investment growth, industrial modernization, technological upgrading, and increased innovation significantly improve the efficiency of enterprises.

The assessment of the effectiveness of investment projects using international financial indicators such as NPV, IRR, and PI made it possible to determine their economic feasibility. At the same time, a positive NPV in the example of a technological modernization project, an IRR higher than the discount rate, and a PI greater than 1 showed a high return on investment. The analysis showed that the introduction of innovative technologies increased labor productivity by 12-15%, TFP by 3%, and production capacity by 18%.

Another important finding of the study is that the integration of investment and innovation processes enhances the synergistic effect. According to the results of regression analysis, a 1% increase in investment has a positive impact on production of 0.25%, while an increase in innovation activity has a positive impact of 0.38%. The combined effect of these processes is 1.5 times higher than the individual effect.

Thus, investment and innovation-driven development of production is the main factor in creating added value in the real sector, improving product quality, rational use of resources, and increasing international competitiveness.

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