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FORECASTING THE SOCIO-ECONOMIC EFFECTS OF FIXED ASSET MANAGEMENT IN INDUSTRIAL ENTERPRISES

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Abstract. The article examines a scenario forecasting toolkit for assessing the results of implementing an integrated fixed asset management mechanism in industrial enterprises. The proposed approach is based on the development of baseline, optimistic, and pessimistic scenarios and enables a quantitative assessment of economic, social, and organizational outcomes over the forecast period of 2026–2029. The scenario-based assessment incorporates indicators of equipment technical availability, operating costs, labor productivity, energy intensity, export revenue, the level of digitalization, and integrated performance indicators. Possible trajectories of changes in fixed asset management efficiency are identified under different conditions of investment activity, modernization, and digital transformation.

Keywords: fixed assets, industrial enterprise, scenario forecasting, socio-economic effect, management efficiency, baseline scenario, optimistic scenario, pessimistic scenario, digitalization.

The effectiveness of fixed asset management in industrial enterprises is largely determined by the intensity of asset renewal, the investment capacity of enterprises, and the extent to which digital technologies are implemented [3; 10]. Under current conditions, improving the efficiency of fixed asset utilization requires a combination of technical, economic, and organizational management instruments aimed at the timely modernization of equipment, maintaining its technical availability, and ensuring the rational use of production capacity [1; 2; 5].

Changes in an enterprise's operating environment may result in different trends in its economic, social, and organizational indicators. Therefore, assessing the expected effectiveness of managerial decisions requires consideration of several possible development alternatives and a quantitative evaluation of the potential outcomes under each of them.

This study proposes a scenario forecasting toolkit for evaluating the results of implementing an integrated fixed asset management mechanism. The toolkit involves the development of baseline, optimistic, and pessimistic scenarios, which make it possible to assess the potential outcomes of management measures over the forecast period of 2026–2029.

The scenarios differ in terms of investment provision, the intensity of fixed asset modernization, and the pace of the enterprise's digital transformation. The importance of investment, fixed asset renewal, and digitalization of management systems has been addressed in studies focused on improving fixed capital management in industrial enterprises [3; 4; 10].

The baseline scenario represents the most probable development path under the assumption that the existing operating conditions of the enterprise remain relatively stable. It provides for the consistent implementation of planned measures, moderate rates of equipment modernization, and the continued development of digital management tools.

The optimistic scenario assumes an increase in investment activity, expanded financing for modernization, accelerated equipment renewal, and more intensive implementation of digital technologies. Investment provision and digitalization create additional opportunities to improve the technical availability of fixed assets and the efficiency of their utilization [3; 9; 10]. Under this scenario, a more intensive improvement in production, technical, and economic indicators is expected.

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The pessimistic scenario is based on the possibility of limited investment resources, slower modernization and digital transformation, as well as deterioration in external economic conditions. Under these circumstances, the rate of improvement in fixed asset management efficiency is expected to decline, resulting in a slower achievement of planned targets.

Table 1

Scenario Conditions for the Implementation of the Fixed Asset Management Mechanism, 2026–2029

Scenario	Key Assumptions	Expected Outcome
Optimistic	Increased investment activity, accelerated digitalization, implementation of EAM, APM, and CMMS technologies, and expanded financing for modernization	Accelerated renewal of fixed assets, reduced asset wear, improved technical availability, and higher management efficiency
Baseline	Preservation of the current macroeconomic environment, investment activity, and existing pace of digitalization	Implementation of measures in accordance with estimated parameters and achievement of forecast values
Pessimistic	Declining investment activity, limited modernization financing, slower digitalization, and deterioration in external economic conditions	Slower renewal of fixed assets and a lower rate of improvement in management efficiency

Source: developed by the author based on the research findings.

The three scenarios are differentiated according to investment provision, digital transformation, and the modernization of fixed assets. This differentiation makes it possible to compare the potential results of implementing the mechanism under different operating conditions. Unlike the use of a single forecast value, the scenario-based approach enables the determination of a range of possible changes and allows the risk of actual indicators deviating from baseline parameters to be taken into account.

For the quantitative assessment of the effectiveness of the integrated mechanism, the Reff indicator is used. It reflects the combined impact of technical, economic, organizational, and digital changes on enterprise performance. Its calculation takes into account the dynamics of capital productivity, the equipment technical availability ratio, labor productivity, operating costs, equipment failure frequency, and the level of digitalization.

The use of technical and economic indicators to assess fixed asset utilization efficiency is a traditional area of fixed capital analysis [5; 11]. In the proposed approach, these indicators are supplemented by an assessment of digital and socio-organizational outcomes, thereby expanding the analytical capacity of the forecasting framework.

At the same time, the Ifame and Reff indicators perform different methodological functions. Ifame is used to diagnose the achieved level of fixed asset management efficiency and to justify the choice of an appropriate development strategy, whereas Reff is intended to quantify the expected outcomes following the implementation of a set of organizational, technical, and digital measures.

The economic effectiveness of the mechanism is assessed through changes in a set of indicators characterizing fixed asset utilization and the enterprise's production and economic performance. According to the calculations, capital productivity increases from 2.54 to 2.9–3.0 UZS/UZS, while the equipment technical availability ratio rises from 0.74 to 0.85. At the same time, specific energy intensity decreases from 7,200 to 6,300–6,400 kWh/t, while the total cost of ownership of equipment decreases from USD 35 million to USD 30 million. These indicators were calculated on the basis of the practical testing of the mechanism, data from the surveyed enterprises, and scenario modeling.

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Scenario calculations for textile enterprises in the Bukhara region indicate a potential 12–15% reduction in operating costs, an increase in the equipment technical availability ratio to 0.84–0.86, a 10–13% increase in labor productivity, an 8–10% increase in export revenue, and a 10–12% reduction in production energy intensity.

The results demonstrate the integrated nature of the economic effect. It is generated not by changes in a single indicator but by the combined impact of equipment modernization, improved maintenance, more efficient utilization of fixed assets, and the introduction of digital management tools. The integrated nature of improving fixed asset management mechanisms is also addressed in previous studies [1; 2; 5].

Alongside economic outcomes, the scenario-based assessment also includes social and organizational effects. Improvements in fixed asset management are accompanied by changes in the organization of production processes, interaction between structural units, requirements for employee qualifications, and the nature of managerial decision-making [6; 7; 8].

The calculations indicate a projected 33.3% reduction in employee turnover, a 25.0% reduction in work-process failures and disruptions, a 12.0% increase in labor productivity, and a 20.0% increase in employee motivation. Such dynamics indicate the expected strengthening of human resource capacity, improvement in organizational resilience, and better interaction between production and management units. Therefore, the effectiveness of improved fixed asset management is reflected not only in technical and economic parameters but also in the socio-organizational characteristics of enterprise performance.

For a comprehensive assessment of the results, a system of interrelated indicators is employed: Reff reflects the overall effectiveness of the mechanism's implementation, Ek represents economic efficiency, Sint reflects social and organizational outcomes, and Udig represents the level of management digitalization. Their combined application provides a more comprehensive assessment of the economic and socio-organizational outcomes of the mechanism.

Particular importance in the scenario-based assessment is attached to the projected dynamics of the integrated Ifame indicator, which makes it possible to determine changes in fixed asset management efficiency resulting from the implementation of the relevant strategy.

Table 2

Forecast Dynamics of the Ifame Indicator at Textile Enterprises

Enterprise	Strategy Implemented	Ifame, 2025	Ifame, 2029	Δ Ifame	Growth, %
LLC “Kamalak Shabnam Teks”	Recovery-Adaptive Strategy	0.27	0.72	+0.45	+166.7
PE “Ruxshana Teks”	Structural-Integrative Strategy	0.61	0.88	+0.27	+44.3
LLC “Merganteks”	Innovation-Predictive Strategy	0.92	0.95	+0.03	+3.3

Source: author's scenario calculations.

The values presented in Table 2 are based on the scenario calculations conducted within the study.

The data reveal substantial differences in the potential efficiency gains depending on the initial condition of each enterprise. For LLC “Kamalak Shabnam Teks”, Ifame is projected to increase from 0.27 to 0.72, corresponding to an absolute increase of 0.45 and a relative increase of 166.7%. For PE “Ruxshana Teks”, the indicator rises from 0.61 to 0.88, representing an increase of 44.3%. For LLC “Merganteks”, Ifame is projected to increase from 0.92 to 0.95, corresponding to a 3.3% increase.

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The highest relative increase is observed for the enterprise with the lowest initial efficiency level, as it has the greatest reserves for improving management performance. As the initial Ifame value rises, the potential for further quantitative growth decreases, while the management priority shifts toward consolidating the achieved level and further qualitative improvement of the fixed asset management system.

Thus, the projected dynamics of Ifame reflect not only changes in the integrated indicator itself but also differences in the potential for efficiency improvement among enterprises operating at different initial levels of management development. To summarize the economic, socio-organizational, and digital outcomes of the mechanism's implementation, a comparative assessment of the surveyed enterprises was conducted.

Table 3

Comparative Assessment of the Effectiveness of the Fixed Asset Management Mechanism

Enterprise	Ek	Sint	Udig	Reff
LLC “Merganteks”	1.21	0.83	0.85	1.05
PE “Ruxshana Teks”	1.15	0.78	0.72	0.98
LLC “Kamalak Shabnam Teks”	1.08	0.73	0.55	0.92
Average across enterprises	1.15	0.78	0.71	0.98

Source: author's calculations.

The values of Ek, Sint, Udig, and Reff reflect the comparative assessment of the implementation results of the proposed mechanism at the surveyed textile enterprises. The comparative analysis shows that the highest Reff value, 1.05, was recorded for LLC “Merganteks”, which also demonstrates the highest level of digitalization, with Udig equal to 0.85. For PE “Ruxshana Teks”, the corresponding values are 0.98 and 0.72, while for LLC “Kamalak Shabnam Teks” they amount to 0.92 and 0.55, respectively.

The findings indicate a relationship between the level of digitalization and the overall effectiveness of fixed asset management. Enterprises in which digital technologies are more deeply integrated into asset management processes demonstrate higher values of the integrated performance indicator. The importance of digitalization and investment in fixed capital for improving enterprise management efficiency is also examined in studies [9; 10].

The practical testing of the proposed forecasting toolkit at textile enterprises in the Bukhara region demonstrated its applicability to the assessment of modernization and digital transformation outcomes. The developed approach can also be adapted for enterprises in other industrial sectors, taking into account sector-specific characteristics, the structure of fixed assets, and the achieved level of digitalization.

Thus, the improved scenario forecasting toolkit enables a quantitative assessment of the economic, social, and organizational outcomes of implementing the integrated fixed asset management mechanism under different enterprise operating conditions. The use of baseline, optimistic, and pessimistic scenarios makes it possible to determine the potential range of results for the forecast period of 2026–2029.

The practical significance of the proposed approach lies in its ability to assess in advance the potential consequences of management measures while taking into account changes in investment, technical, and digital conditions. This enhances the justification of decisions related to modernization, digitalization, and organizational development and provides a basis for adjusting managerial measures in accordance with the expected dynamics of socio-economic indicators.

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