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ENHANCING THE INVESTMENT ATTRACTIVENESS OF MINING INDUSTRY ENTERPRISES THROUGH DIGITAL TRANSFORMATION AND TECHNICAL SAFETY

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Abstract

This paper examines the relationship between digital transformation, technical safety and investment attractiveness in mining enterprises. Drawing on the digital transformation programme and complementary cooperation approach presented in the dissertation abstract, it analyses production monitoring, risk management and investment project assessment. It explains the importance of baseline indicators and phased implementation when evaluating expected economic benefits.

Keywords: digital transformation, technical safety, investment attractiveness, operational risk, environmental monitoring, cybersecurity.

Problem Statement and Research Method

Production continuity, equipment reliability and safety conditions affect investment decisions in mining enterprises. Equipment failures, unplanned downtime and environmental incidents increase costs and intensify uncertainty regarding project outcomes. Since digital technologies enable timely access to information about these processes, they should be considered a component of the mechanism for enhancing investment attractiveness.

N. N. Zikrillayev's dissertation abstract proposes a complementary cooperation flowchart based on assessing the relationship between technical safety and investment attractiveness [1, Figure 5]. It treats safety measures and economic efficiency as mutually reinforcing processes. The digital transformation



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programme encompasses technological modernisation, production optimisation, safety and environmental protection, and investment projects [1, Figure 8].

The objective of this paper is to explain the mechanisms through which digital transformation affects investment attractiveness, using these approaches, and to formulate practical recommendations for enterprise implementation. The study employs systems analysis, logical synthesis and comparative interpretation of the findings in the abstract. It focuses on production and safety processes in mining enterprises, particularly JSC Almalyk MMC.

Economic Effects of Digital Transformation

The economic significance of digital transformation lies in making processes measurable and ensuring that management decisions rely on trustworthy data. Equipment condition monitoring, collection of technological parameters and cost analysis help identify sources of inefficiency within an enterprise. Production, maintenance and financial accounting data must therefore be coordinated. The presence of digital solutions in individual departments does not, by itself, ensure that they contribute to a common economic outcome.

The conclusions of the abstract indicate that a comprehensive digital transformation programme offers the potential to reduce operating costs by 15–20%, increase production volume by 25–30%, and decrease the number of technical failures by 40–50% [1, conclusion on digital transformation]. These figures represent the programme's potential benefits. They should not be interpreted as results already achieved across all mining enterprises.

Cost reductions may arise from controlling energy and material consumption, planning maintenance and allocating resources. Higher production volumes depend on reducing downtime and using existing capacity more efficiently. Fewer failures can produce sustainable results when combined with planned preventive



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maintenance and early detection of warning signs. These relationships provide practical directions for assessing the programme's economic benefits.

Assessing a digital project's efficiency requires consideration of software, equipment, integration, staff training and service costs. Comparing the savings and additional income generated by the project with these costs determines the investment's economic viability. Comparisons between pre-implementation and post-implementation performance must account for changes in production volume and product mix; otherwise, the contribution of digital technology may be confused with the effects of other factors.

Technical Safety and Investor Confidence

Technical safety affects investment attractiveness through operational stability and risk management. Accidents and production interruptions may affect enterprise costs, delivery obligations and cash flows. Safety investments should therefore be assessed not only as current expenditure but also as resources that help reduce losses.

The abstract describes alignment with safety standards, systematisation of quantitative and qualitative data, and the provision of risk reduction briefings as part of applying the complementary cooperation approach at JSC Almalyk MMC [1, analysis accompanying Figure 5]. Linking safety information with investment assessment is essential. Having information on risks is insufficient unless it is translated into decisions and preventive measures.

Digital monitoring expands opportunities to observe technical and environmental risks. Timely transmission of information on equipment deviations, production stoppages and environmental indicators to the responsible departments can accelerate action. However, an automatic alert does not itself eliminate a risk.



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Procedures for verifying the alert, assessing its severity and making the appropriate decision must be clearly established.

Digitalisation also increases cybersecurity requirements. Unauthorised access to data or failure of control systems may adversely affect production stability. The allocation of access rights, protection of critical data and emergency recovery procedures should therefore be integral to the digital programme. Staff competence influences whether these measures are implemented effectively.

For investors, the significance of safety becomes apparent through verifiable results. Consistent reporting on failures, downtime and preventive measures supports risk assessment. Coordinating environmental and social responsibility information with financial data provides a more complete picture of the enterprise's capacity to operate sustainably.

Implementation Recommendations and Conclusion

A phased approach to digital transformation is recommended. First, the largest source of production losses or risk should be identified and a pilot site selected. Baseline values should be recorded for the number of failures, downtime duration, energy consumption per unit of output and maintenance costs. Comparing subsequent results with this baseline identifies the programme's economic benefits and the conditions required for expansion.

Common data quality requirements are essential. The frequency of indicator collection, units of measurement and verification procedures must be coordinated. Joint assessment by the production unit, financial service and safety department links the technological capabilities of the digital project with economic objectives. Monitoring should consider not only the total number of incidents but also their severity and their relationship to production activity.



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Decisions to expand the programme should be based on pilot results. Solutions with demonstrated benefits can be adapted to other sites; where results are insufficient, data quality, technological integration and staff preparedness should be reassessed. This approach helps improve the effectiveness of spending on digital technologies and manage implementation risks.

Digital transformation and technical safety are interrelated factors in enhancing the investment attractiveness of mining enterprises. The comprehensive programme presented in the abstract indicates potential benefits in terms of costs, production and failures. Translating this potential into practical results requires coordinated economic assessment, reliable data, cybersecurity and staff preparedness. On this basis, risk control and operational transparency can help strengthen investor confidence.

References

1. Zikrillayev, N. N. Improving the Mechanism for Enhancing the Investment Attractiveness of Mining Industry Enterprises. Abstract of a PhD dissertation in Economics, specialty 08.00.03 — Industrial Economics. Tashkent, 2026. Main findings and conclusions in the Uzbek-language section.