ECONOSCITECH INTEGRATION

ISSUE 6

INTERNATIONAL SCIENTIFIC ELECTRONIC JOURNAL

TASHKENT STATE UNIVERSITY OF ECONOMICS

American University of Technology
Powered by Arizona State University®

ISSN: 3060-5075

Acceptance of articles
PUBLISHED MONTHLY

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CONTACT: +998 94 3540880 https://econoscitech-integration-journal.uz

2026

THE SCIENTIFIC-POPULAR ELECTRONIC JOURNAL **"ECONOSCITECH-INTEGRATION"** HAS BEEN REGISTERED UNDER THE NUMBER C-5669651 BY THE AGENCY FOR INFORMATION AND MASS COMMUNICATIONS (AOKA) OF THE REPUBLIC OF UZBEKISTAN, EFFECTIVE FROM OCTOBER 9, 2024.

In accordance with Resolution No. 384/6 dated April 10, 2026, issued by the Presidium of the Supreme Attestation Commission under the Ministry of Higher Education, Science and Innovation of the Republic of Uzbekistan, this journal is included in the list of recommended international scientific publications for publishing the primary research findings of doctoral dissertations in the field of Economic Sciences.

Partners: Tashkent State University of Economics / American University of Technology in Tashkent (AUT)

Electronic publication, Issue 6. 374 pages.
Approved for publication on Iyun, 2026.

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DIGITAL TRANSFORMATION OF MANAGEMENT ACCOUNTING IN THE MINING SECTOR

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Abstract. This article examines the digital transformation of management accounting in the mining industry of the Republic of Uzbekistan, with a particular focus on the practical experience of Joint-Stock Company "Navoi Mining and Metallurgical Combinat" (NMMC), the country's largest mining enterprise. The study analyzes the implementation of modern technological solutions, including automated mining control systems, digital twins, and industry-specific ERP systems. Based on the analysis of NMMC's digital transformation program, the article reviews key projects such as the implementation of "1C:ERP Holding Management" for IFRS reporting and budgeting, as well as the establishment of a unified production situational center for real-time control over geological exploration, extraction, transportation, and processing. The main effects of digitalization are identified as the creation of a single source of reliable data, automation of primary data collection, real-time cost management, and a significant reduction in accounting labor costs.

Keywords: management accounting, mining industry, digital transformation, ERP systems, 1C:ERP, NMMC, automation, digital twins.

Аннотация. В данной статье рассматривается цифровая трансформация управленческого учета в горнодобывающей промышленности Республики Узбекистан на примере деятельности Акционерного общества «Навоийский горно-металлургический комбинат» (НГМК), крупнейшего горнодобывающего предприятия страны. Исследование посвящено анализу внедрения современных технологических решений, включая автоматизированные системы управления горным производством, цифровые двойники и специализированные ERP-системы. На основе изучения программы цифровой трансформации НГМК рассмотрены ключевые проекты, в том числе внедрение системы «1С:ERP Управление холдингом» для подготовки отчетности по МСФО и бюджетирования, а также создание единого производственного ситуационного центра для оперативного контроля процессов геологоразведки, добычи, транспортировки и переработки сырья. В результате исследования выявлены основные эффекты цифровизации: формирование единого источника достоверных данных, автоматизация сбора первичной информации, управление затратами в режиме реального времени и существенное сокращение трудоемкости учетных процессов.

Ключевые слова: управленческий учет, горнодобывающая промышленность, цифровая трансформация, ERP-системы, 1С:ERP, НГМК, автоматизация, цифровые двойники.

INTRODUCTION

The mining industry is one of the key sectors of the economy of the Republic of Uzbekistan, generating a significant share of export revenues and serving as a foundation for the development of related industries. The largest enterprises in the sector, including the Navoi Mining and Metallurgical Company (NMMC) and the Almalyk Mining and Metallurgical Complex (AMMC), are among the leading producers of gold, uranium, copper, and other strategically important mineral resources. In the context of increasing global competition and volatility in commodity markets, Uzbek mining companies face a growing need to improve production efficiency and optimize costs.

A well-organized management accounting system serves as a key instrument for addressing these challenges by providing management with reliable and timely information necessary for informed decision-making. Digital transformation creates fundamentally new opportunities for improving these processes. The implementation of automated mining management systems, the development of digital twins of production

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processes, and the adoption of industry-specific ERP solutions make it possible to move from retrospective analysis to real-time cost management, ensure asset-level cost accounting for each piece of equipment, and establish a unified information environment that integrates all stages of the production cycle, from extraction to the shipment of finished products.

International practice demonstrates that the digitalization of accounting processes has become a necessary condition for maintaining the competitiveness of mining enterprises.

LITERATURE REVIEW

The rapid development of digital technologies has significantly transformed management accounting practices across various industries, including mining. Contemporary studies emphasize that digital transformation extends beyond the automation of accounting procedures and involves the integration of operational, financial, and analytical information into a unified management system. As a result, management accounting is increasingly evolving from a retrospective reporting function into a strategic tool for real-time decision-making.

In the mining industry, digital transformation is closely associated with the implementation of Enterprise Resource Planning (ERP) systems, Industrial Internet of Things (IIoT) technologies, telemetry systems, and digital twins. These technologies enable enterprises to collect, process, and analyze large volumes of production data, thereby improving the accuracy of cost allocation and performance measurement. Researchers note that the integration of production and accounting information systems creates opportunities for activity-based costing, real-time monitoring of production costs, and enhanced transparency of business processes.

A growing body of literature also highlights the importance of the Mine-to-Mill concept, which aims to optimize the entire mining value chain from drilling and blasting to mineral processing. The implementation of Mine-to-Mill approaches requires accurate and timely information on production parameters and costs, making digital management accounting systems a critical component of operational efficiency. Recent studies demonstrate that digital solutions contribute to reducing operating costs, improving resource utilization, and strengthening managerial decision-making.

At the same time, researchers identify several challenges associated with digital transformation in mining enterprises. The most frequently cited barriers include the integration of legacy information systems with modern digital platforms, cybersecurity issues, high implementation costs, and shortages of personnel with both technical and managerial competencies. These challenges are particularly relevant for large mining enterprises with complex organizational structures and extensive production infrastructures.

Despite the growing number of studies devoted to digital transformation, limited attention has been paid to the specific implications of digital technologies for management accounting in the mining industry of developing economies. In particular, the experience of mining enterprises in Uzbekistan remains insufficiently explored in the academic literature. This research seeks to address this gap by examining the digital transformation of management accounting at Navoi Mining and Metallurgical Company (NMMC), one of the largest mining enterprises in Central Asia.

The theoretical foundation of this study is based on the concepts of digital transformation, management accounting modernization, and information integration. Digital transformation is viewed as a comprehensive organizational process involving the adoption of digital technologies to redesign business processes, improve information flows, and enhance managerial decision-making capabilities.

The study also draws on the concept of the Single Source of Truth (SSOT), which assumes the existence of a unified and reliable data environment accessible to all organizational units. In management accounting, the SSOT approach reduces information asymmetry, eliminates data duplication, and improves the consistency of managerial reports.

Another important theoretical component is the integration of operational and accounting information systems. According to this perspective, the effectiveness of management accounting increases when production data generated through telemetry systems, sensors, and digital monitoring platforms are directly connected with ERP-based accounting systems. Such integration enables real-time cost accounting and supports data-driven management decisions.

The study also incorporates the principles of activity-based costing and Mine-to-Mill optimization. These approaches emphasize the importance of tracing costs to specific production activities, equipment units, and operational stages, thereby providing managers with more accurate information on resource utilization and process efficiency.

Based on these theoretical assumptions, this research examines how the implementation of digital technologies at NMMC contributes to the creation of an integrated information environment, improves the quality of management accounting, and supports operational and strategic decision-making in the mining industry.

RESEARCH METHODOLOGY

This study employs a systematic and comparative research approach to examine the digital transformation of management accounting in the mining industry. The research is based on the analysis of scientific literature, corporate reports, and practical materials related to the digital transformation initiatives of Joint-Stock Company “Navoi Mining and Metallurgical Company” (NMMC). Methods of comparative analysis, synthesis, and logical generalization were applied to evaluate the impact of ERP systems, digital twins, and automated production management technologies on management accounting processes. The study also uses a case-study approach to identify the key outcomes, benefits, and challenges of digital transformation in the mining sector.

ANALYSIS AND RESULTS

The study found that the digital transformation of management accounting in Uzbekistan’s mining industry, examined through the case of Joint-Stock Company “Navoi Mining and Metallurgical Company” (NMMC), represents a comprehensive process of integrating production and financial data into a unified information environment. An analysis of NMMC’s digitalization program, implemented with the participation of Boston Consulting Group (BCG), revealed that the key direction of transformation is the transition from fragmented automation to the establishment of end-to-end technological chains integrating geological exploration, mining, transportation, and ore processing with accounting and budgeting systems.

The practical implementation of these approaches has been reflected in the deployment of the 1C:ERP Holding Management platform and the establishment of a Unified Production Situational Center within the Central Mining Administration. These initiatives have enabled the integration of mining equipment telemetry data with accounting modules, thereby creating a single digital environment for operational and financial management.

The study revealed that the principal outcome of digitalization was the establishment of a Single Source of Truth, which ensured data consistency across geological, operational, and financial departments. The automation of primary data collection significantly reduced the influence of human factors in recording ore production volumes and material movements, enabling a transition from retrospective performance analysis to real-time cost management.

A major benefit of the implemented digital solutions was the ability to conduct activity-based cost accounting at the level of individual mining equipment units and production sites, which had previously been technically unattainable under traditional accounting practices. Furthermore, digital transformation led to a substantial reduction in the labor intensity associated with accounting and reporting processes, allowing human resources to be reallocated from routine administrative tasks to monitoring, analytical, and decision-support functions.

At the same time, the study identified several challenges accompanying digital transformation. The most significant of these include difficulties in integrating legacy dispatch and operational control systems with modern accounting platforms, as well as a shortage of professionals possessing interdisciplinary expertise in mining engineering, management accounting, and information technologies.

These challenges define the future trajectory of management accounting development in the mining industry. Promising directions include the implementation of Mine-to-Mill optimization systems, the advancement of predictive cost analytics based on machine learning technologies, and deeper integration of digital twins of production processes with ERP accounting modules. The adoption of these approaches is expected to improve the accuracy of managerial calculations, enhance the transparency of production and economic processes, and strengthen the information base for managerial decision-making.

The results obtained in the course of the study make it possible to examine the digital transformation of management accounting in the mining industry of Uzbekistan within the broader context of global trends. The experience of Joint-Stock Company Navoi Mining and Metallurgical Company demonstrates that the digitalization of accounting processes at mining enterprises is not limited to the replacement of software alone, but represents a fundamental restructuring of information flows and organizational culture. The integration of mining equipment telemetry systems with ERP-class platforms implemented within the Unified Situation Center of NMMC confirms that the boundaries between operational and accounting systems are gradually disappearing. This development had previously been considered a promising but difficult-to-achieve direction.

It is important to compare the identified effects with the objectives declared in the company’s transformation program. The achievement of a Single Source of Truth and the transition to real-time activity-based cost accounting should be viewed not only as technological achievements but also as instruments for enhancing business manageability under conditions of volatile commodity markets. The ability to obtain reliable information on the cost of each stage of the production process in a timely manner creates prerequisites for the implementation of lean production methods and the optimization of mining operations according to the principle

of “maximum value at minimum cost” within the Mine-to-Mill Optimization approach.

At the same time, the challenges identified during the study deserve separate discussion. The difficulties associated with integrating legacy systems with modern accounting platforms, noted during the analysis, represent a typical challenge for enterprises with a long history and well-developed production infrastructure. Overcoming these difficulties requires not only technical solutions but also the revision of interaction procedures between IT departments, production units, and the financial function. Further research in this area could focus on developing methodologies for assessing the economic efficiency of implementing digital twins in accounting processes, as well as on conducting a comparative analysis of the digitalization practices of NMMC and Almalyk Mining and Metallurgical Complex.

The conducted study of the digital transformation of management accounting in the mining industry of the Republic of Uzbekistan, based on the case of Joint-Stock Company Navoi Mining and Metallurgical Company, allows the following key conclusions to be drawn.

First, the digital transformation of management accounting at NMMC is systemic in nature and is implemented through two interrelated directions: the automation of financial and accounting functions based on the 1C:ERP Holding Management platform and the digitalization of operational control over production processes within the Unified Situation Center. This dual approach ensures the integration of data on physical indicators of ore extraction and processing with their financial valuation.

Second, the key results of digitalization include the establishment of a unified and reliable source of data for all management levels, the elimination of information duplication and distortion at the interfaces between production and economic departments, and the creation of a technical foundation for activity-based cost accounting at the level of individual equipment units and mining sites. The automation of primary data collection has significantly reduced labor costs and minimized the influence of human factors.

Third, despite the achievements attained, the process of digital transformation is associated with a number of organizational and technical challenges, including the complexity of integrating heterogeneous systems and the shortage of qualified personnel. Addressing these issues requires further development of employee competencies and improvement of integration mechanisms.

The prospects for the development of management accounting in the industry are associated with the expansion of analytical capabilities, the implementation of predictive cost models based on data generated by digital twins, and the replication of NMMC’s successful experience across other mining enterprises in Uzbekistan. Thus, the digital transformation of accounting processes serves not only as a tool for improving the efficiency of current management but also as a strategic factor in ensuring the long-term competitiveness of domestic mining enterprises in the global market.

CONCLUSION AND RECOMMENDATIONS

When outlining the future development of management accounting in Uzbekistan’s mining industry, particular emphasis should be placed on enhancing the analytical capabilities of accounting systems, implementing predictive cost models based on data generated by digital twins of production processes, and replicating NMMC’s successful experience across other enterprises in the sector, including the Almalyk Mining and Metallurgical Complex.

In conclusion, the digital transformation of accounting processes should be regarded not only as an effective tool for improving operational efficiency but also as a strategic factor in ensuring the long-term competitiveness of domestic mining enterprises in the global market.

REFERENCES

1. Bochkov P.V., Timofeev D.I. Management accounting under conditions of mining production digitalization // Management Accounting. – 2024. – No. 2. – P. 45–52.
2. Boston Consulting Group. Digital transformation in the mining industry: Global trends and regional specifics [Electronic resource]. – 2024. – Available at: https://www.bcg.ru/ru/publications
3. Experience of implementing an automated dispatching system for a mining haulage complex at a coal open-pit mine // Mining Industry. – 2024. – No. 3. – P. 72–76.
4. Joint-Stock Company Navoi Mining and Metallurgical Company. Annual Report 2024. – Navoi: NMMC, 2025. – 156 p.
5. Kalacheva L.V., Khasanova L.R. Digital transformation of management accounting in the mining industry // Economics and Management: Problems and Solutions. – 2024. – Vol. 3. – No. 4. – P. 89–95.

6. Marinin M.A., Evgrafov M.V., Dolzhikov V.V. Production blasting for a specified ore size distribution within the Mine-to-Mill concept: Current state and prospects // Bulletin of the Tomsk Polytechnic University. Geo Assets Engineering. – 2023. – Vol. 334. – No. 2. – P. 168–179.
7. NMMC continues its digital transformation [Electronic resource]. – 2025. – Available at: https://nuz.uz/tag/czifrovaya-transformacziya/
8. Polymetal implemented centralized production accounting based on 1C:ERP [Electronic resource]. – 2025. – Available at: https://www.it-world.ru/news-company/jwdq7d9i95w4kgws0gkwo8c4kgg88gc.html

Proofreader: Xondamir Ismoilov

Layout and Designer: Hasan Maqsudov

2026. № 6

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