

MUHANDISLIK

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ijtimoiy-iqtisodiy, innovatsion texnik,
fan va ta'limga oid ilmiy-amaliy jurnal

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**“GLOBAL RAQAMLI INTEGRATSIYALASHUV:
2030-YILGACHA YASHIL IQTISODIYOTGA O'TISHDA
TEXNOLOGIK VA INDUSTRIAL SANOATNI RIVOJLANTIRISH
ORQALI MIKRO VA MAKROIQTISODIY BARQAROR
O'SISHNI TA'MINLASH DOLZARBLIGI”**

**“GLOBAL DIGITAL INTEGRATION: THE RELEVANCE OF
ENSURING MICRO AND MACROECONOMIC SUSTAINABLE
GROWTH THROUGH TECHNOLOGICAL AND INDUSTRIAL
DEVELOPMENT IN THE TRANSITION TO A GREEN
ECONOMY BY 2030”**

**«ГЛОБАЛЬНАЯ ЦИФРОВАЯ ИНТЕГРАЦИЯ:
АКТУАЛЬНОСТЬ ОБЕСПЕЧЕНИЯ УСТОЙЧИВОГО
МИКРО- И МАКРОЭКОНОМИЧЕСКОГО РОСТА ЧЕРЕЗ
РАЗВИТИЕ ТЕХНОЛОГИЧЕСКОЙ И ИНДУСТРИАЛЬНОЙ
ПРОМЫШЛЕННОСТИ В ПЕРЕХОДЕ К ЗЕЛЁНОЙ
ЭКОНОМИКЕ К 2030 ГОДУ»**

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Bosh muharrir:

Zokirova Nodira Kalandarovna, iqtisodiyot fanlari doktori, DSc, professor

Bosh muharrir o'rinbosari:

Shakarov Zafar G'afforovich, iqtisodiyot fanlari bo'yicha falsafa doktori, PhD, dotsent

Tahrir hay'ati:

Abduraxmanov Kalandar Xodjayevich, O'z FA akademigi, iqtisodiyot fanlari doktori, professor

Sharipov Kongratbay Avezimbetovich, texnika fanlari doktori, professor

Maxkamov Baxtiyor Shuxratovich, iqtisodiyot fanlari doktori, professor

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- 05.01.00 – Axborot texnologiyalari, boshqaruv va kompyuter grafikasi
- 05.01.01 – Muhandislik geometriyasi va kompyuter grafikasi. Audio va video texnologiyalari
- 05.01.02 – Tizimli tahlil, boshqaruv va axborotni qayta ishlash
- 05.01.03 – Informatikaning nazariy asoslari
- 05.01.04 – Hisoblash mashinalari, majmualari va kompyuter tarmoqlarining matematik va dasturiy ta'minoti
- 05.01.05 – Axborotlarni himoyalash usullari va tizimlari. Axborot xavfsizligi
- 05.01.06 – Hisoblash texnikasi va boshqaruv tizimlarining elementlari va qurilmalari
- 05.01.07 – Matematik modellash
- 05.01.11 – Raqamli texnologiyalar va sun'iy intellekt
- 05.02.00 – Mashinasozlik va mashinashunoslik
- 05.02.08 – Yer usti majmualari va uchish apparatlari
- 05.03.02 – Metrologiya va metrologiya ta'minoti
- 05.04.01 – Telekommunikatsiya va kompyuter tizimlari, telekommunikatsiya tarmoqlari va qurilmalari. Axborotlarni taqsimlash
- 05.05.03 – Yorug'lik texnikasi. Maxsus yoritish texnologiyasi
- 05.05.05 – Issiqlik texnikasining nazariy asoslari
- 05.05.06 – Qayta tiklanadigan energiya turlari asosidagi energiya qurilmalari
- 05.06.01 – To'qimachilik va yengil sanoat ishlab chiqarishlari materialshunosligi
- 05.08.03 – Temir yo'l transportini ishlatish
- 05.09.01 – Qurilish konstruksiyalari, bino va inshootlar
- 05.09.04 – Suv ta'minoti. Kanalizatsiya. Suv havzalarini muhofazalovchi qurilish tizimlari
- 10.00.06 – Qiyosiy adabiyotshunoslik, chog'ishtirma tilshunoslik va tarjimashunoslik
- 10.00.04 – Yevropa, Amerika va Avstraliya xalqlari tili va adabiyoti
- 08.00.01 – Iqtisodiyot nazariyasi
- 08.00.02 – Makroiqtisodiyot
- 08.00.03 – Sanoat iqtisodiyoti
- 08.00.04 – Qishloq xo'jaligi iqtisodiyoti
- 08.00.05 – Xizmat ko'rsatish tarmoqlari iqtisodiyoti
- 08.00.06 – Ekonometrika va statistika
- 08.00.07 – Moliya, pul muomalasi va kredit
- 08.00.08 – Buxgalteriya hisobi, iqtisodiy tahlil va audit
- 08.00.09 – Jahon iqtisodiyoti
- 08.00.10 – Demografiya. Mehnat iqtisodiyoti
- 08.00.11 – Marketing
- 08.00.12 – Mintaqaviy iqtisodiyot
- 08.00.13 – Menejment
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- 08.00.15 – Tadbirkorlik va kichik biznes iqtisodiyoti
- 08.00.16 – Raqamli iqtisodiyot va xalqaro raqamli integratsiya
- 08.00.17 – Turizm va mehmonxona faoliyati

Ma'lumot uchun, OAK

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DIGITALIZATION OF ACCOUNTING AND AUDITING AND AUTOMATED CONTROL OF ENVIRONMENTAL COST DEVIATIONS IN THE BUILDING MATERIALS INDUSTRY

Komiljon Abdullajonovich Mirzaev

Researcher, Tashkent State University of Economics

Abstract. This thesis examines the digitalization of environmental cost accounting and auditing in the building materials industry. It proposes an integrated approach based on ERP systems, real-time monitoring, automated deviation analysis, and visual reporting tools. The system is designed to compare actual and standard costs, promptly identify deviations, and provide management and audit activities with reliable information. The proposed approach can improve the accuracy, transparency, and efficiency of environmental cost control and auditing.

Keywords: digitalization, ERP system, real-time monitoring, cost deviations, ABC/XYZ analysis, regression analysis, integrated accounting system, automated audit.

Annotatsiya. Mazkur tezisda qurilish materiallari sanoatida ekologik xarajatlar hisobini yuritish va audit jarayonlarini raqamlashtirish masalalari ko'rib chiqilgan. ERP tizimlari, real vaqt rejimidagi monitoring, og'ishlarni avtomatik tahlil qilish va vizual hisobot vositalariga asoslangan integratsiyalashgan yondashuv taklif etilgan. Mazkur tizim haqiqiy va me'yoriy xarajatlarni taqqoslash, og'ishlarni o'z vaqtida aniqlash hamda boshqaruv va audit faoliyatini ishonchli axborot bilan ta'minlashga qaratilgan. Taklif etilgan yondashuv ekologik xarajatlarni nazorat qilish va auditning aniqligi, shaffofligi hamda samaradorligini oshirishga xizmat qiladi.

Kalit so'zlar: raqamlashtirish, ERP tizimi, real vaqt rejimidagi monitoring, xarajatlar og'ishi, ABC/XYZ tahlili, regressiya tahlili, integratsiyalashgan hisob tizimi, avtomatlashtirilgan audit.

Аннотация. В тезисе рассматриваются вопросы цифровизации учета экологических затрат и аудита в промышленности строительных материалов. Предлагается интегрированный подход, основанный на использовании ERP-систем, мониторинга в режиме реального времени, автоматизированного анализа отклонений и инструментов визуальной отчетности. Система предназначена для сопоставления фактических и нормативных затрат, своевременного выявления отклонений, а также обеспечения управленческой и аудиторской деятельности достоверной информацией. Предлагаемый подход способствует повышению точности, прозрачности и эффективности контроля и аудита экологических затрат.

Ключевые слова: цифровизация, ERP-система, мониторинг в режиме реального времени, отклонения затрат, ABC/XYZ-анализ, регрессионный анализ, интегрированная система учета, автоматизированный аудит.

INTRODUCTION

The building materials industry is technologically complex and involves multi-stage, resource-intensive production processes. For this reason, comparing actual costs with planned costs based on established standards and monitoring them in real time plays a decisive role in increasing production efficiency. In many enterprises, there are opportunities to further improve the substantiation of regulatory cost indicators and strengthen the integration of digital cost-comparison systems with automated monitoring tools. Enhancing these processes can support the timely identification of cost deviations and facilitate well-founded and prompt management decisions. This thesis proposes a systematic approach to the digitalization of environmental cost accounting and auditing and the automated control of deviations.

The proposed system focuses on five areas for identifying deviations from cost standards. First, standard cost indicators for raw materials, energy, and labour resources for each type of product are integrated into the enterprise's ERP (Enterprise Resource Planning) system. Second, sensors, electronic meters, and automated reporting systems are used to record costs in real time. Third, deviation analysis is automated using ABC/

XYZ analysis and statistical methods such as factor analysis and regression models. Fourth, the results are presented to management through a control panel (dashboard), tables, diagrams, and infographics. Fifth, the results of the analysis of deviations caused by internal and external factors are integrated into the audit report. The main directions of the system are summarized in Table 1.

Table 1

Main Directions of the Digital System for Identifying Deviations from Cost Standards¹

Direction	Main activities	Expected results
Digitalization of regulatory costs	Establishing standards for raw materials, energy, and labour costs by product type and integrating them into the ERP system	Automated control based on established cost standards
Real-time monitoring	Recording actual costs online using sensors, electronic meters, and automated reporting systems	Immediate comparison of actual costs with regulatory indicators
Automation of deviation analysis	Applying ABC/XYZ analysis, factor analysis, and regression models	Identification of the causes, significance, and impact of cost deviations
Visual presentation	Presenting analytical results through dashboards, tables, diagrams, and infographics	Clear visual monitoring and support for operational management decisions
Integration into audit reports	Including the results of the analysis of deviations caused by internal and external factors in audit reports	Increased reporting transparency and improved audit reliability

A unified chart of accounts is integrated into the financial and managerial accounting information system through a digital control algorithm. This algorithm is implemented in five stages. At the first stage, all types of costs—raw materials, energy, wages, depreciation, social contributions, and environmental costs—are identified using special codes. At the second stage, they are classified according to their economic significance and adapted to both accounting systems. At the third stage, data are consolidated in a single electronic database and linked to cost volumes, product types, technological stages, and workshops. At the fourth stage, the costs attributable to a unit of product and deviations from established standards are automatically determined. At the fifth stage, real-time analytical indicators, performance indicators, and visual reports are generated. This database not only serves as a source of strategic information for management but also creates a reliable basis for audit activities.

The technical foundation of the modern system consists of software platforms. In particular, data recorded in “1C: Accounting”, ERP systems, and other accounting platforms can be processed in real time, calculations can be performed, and automatic reports can be generated. Integrating the environmental asset accounting model into the ERP system makes it possible to link environmental assets with electronic monitoring and automated reporting tools, maintain an electronic asset register, calculate depreciation, and manage maintenance costs in real time. This significantly increases the accuracy and timeliness of environmental accounting.

Digitalization contributes to the development of audit activities by complementing periodic audit procedures with continuous analytical monitoring. Within an automated digital system, documentary information can be verified, while cost deviations and environmental risks can be monitored in real time and analytical indicators can be generated automatically. This reduces audit risks, improves governance, and enhances the reliability of audit results.

CONCLUSION AND SUGGESTIONS

In conclusion, the integration of an automated cost control system, a unified accounting algorithm, and an ERP system in the building materials industry can improve the accuracy, reliability, and efficiency of environmental accounting, management, and auditing. The practical implementation of these solutions requires the digitalization of the regulatory framework, integration with ERP systems, and the training of internal auditors in the use of digital tools. Future research may examine opportunities for monitoring environmental risk indicators in real time using blockchain technology and artificial intelligence.

¹ Source: author’s developments.



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