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IMPROVING THE ORGANIZATIONAL AND ECONOMIC MECHANISMS FOR ASSESSING THE EFFICIENCY OF AUDIT SERVICES PROVIDED TO BUSINESS ENTITIES

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Annotatsiya. Tadbirkorlik subyektlariga ko'rsatiladigan auditorlik xizmatlari samaradorligini baholashning tashkiliy-iqtisodiy mexanizmlari tadqiq etilgan. O'zbekistonda auditorlik xizmatlari bozorining rivojlanishi, jumladan, auditorlik tashkilotlari va sertifikatlangan auditorlar sonidagi o'zgarishlar, xizmatlar hajmining o'sishi hamda xalqaro standartlarga o'tish jarayonlari tahlil qilingan. Auditorlik xizmatlari samaradorligini faqat moliyaviy natijalar asosida emas, balki audit sifati, mehnat sig'imi, risklarni aniqlash darajasi, raqamlashtirish, mijoz uchun yaratilgan iqtisodiy qiymat va auditorlik xulosasining ishonchiligi kabi mezonlar majmui asosida baholash zarurligi asoslangan. Integral Audit Service Efficiency (IASE) — auditorlik xizmatlari samaradorligining integral indeksi hamda tashkiliy-iqtisodiy mexanizmning bosqichma-bosqich modeli ishlab chiqilgan. Taklif etilgan yondashuv auditorlik tashkilotlariga resurslarni maqbul taqsimlash, risklarga asoslangan rejalashtirishni amalga oshirish va xizmatlar sifatini tizimli monitoring qilish imkonini beradi.

Kalit so'zlar: auditorlik xizmatlari, audit samaradorligi, tadbirkorlik subyekti, audit sifati, riskka asoslangan audit, tashkiliy-iqtisodiy mexanizm, raqamlashtirish, samaradorlik indeksi, auditorlik tashkiloti.

Аннотация. Исследованы организационно-экономические механизмы оценки эффективности аудиторских услуг, оказываемых субъектам предпринимательства. Проанализировано развитие рынка аудиторских услуг в Узбекистане, включая изменения в количестве аудиторских организаций и сертифицированных аудиторов, рост объема оказываемых услуг, а также процессы перехода на международные стандарты. Обоснована необходимость оценки эффективности аудиторских услуг не только на основе финансовых результатов, но и с учетом совокупности таких критериев, как качество аудита, трудоемкость, степень выявления рисков, цифровизация, экономическая ценность, создаваемая для клиента, и надежность аудиторского заключения. Разработаны интегральный индекс эффективности аудиторских услуг — Integral Audit Service Efficiency (IASE) и поэтапная модель организационно-экономического механизма. Предлагаемый подход позволяет аудиторским организациям оптимально распределять ресурсы, осуществлять планирование на основе рисков и систематически контролировать качество оказываемых услуг.

Ключевые слова: аудиторские услуги, эффективность аудита, субъект предпринимательства, качество аудита, риск-ориентированный аудит, организационно-экономический механизм, цифровизация, индекс эффективности, аудиторская организация.

Abstract. The organizational and economic mechanisms for assessing the efficiency of audit services provided to business entities are examined. The development of the audit services market in Uzbekistan is analyzed, including changes in the number of audit firms and certified auditors, growth in the volume of services, and the transition to international standards. The study substantiates the need to assess the efficiency of audit services not solely on the basis of financial results, but through a comprehensive set of criteria, including audit quality, labor intensity, the extent of risk identification, digitalization, the economic value created for the client, and the reliability of the audit opinion. An Integral Audit Service Efficiency (IASE) index and a staged model of the organizational and economic mechanism are developed. The proposed approach enables audit firms to allocate resources optimally, implement risk-based planning, and systematically monitor service quality.

Keywords: audit services, audit efficiency, business entity, audit quality, risk-based audit, organizational and economic mechanism, digitalization, efficiency index, audit firm.

INTRODUCTION

The development of corporate governance, the increasing transparency of financial reporting, and the creation of a reliable information environment for investors are steadily enhancing the economic importance of audit services in Uzbekistan. An audit not only confirms the reliability of a business entity's financial statements but also identifies areas for improvement in the internal control system, assesses financial and operational risks, and enhances the quality of information available for management decision-making. Consequently, when evaluating the efficiency of audit services, cost and revenue indicators should be considered alongside quality, timeliness, risk, technological capability, and the value created for the client.

The audit market in the Republic has expanded considerably in recent years. According to the Ministry of Economy and Finance, at the end of 2023, there were 138 audit firms and 1,003 auditors. By the end of 2024, the number of audit firms had risen to 153, while the number of individuals holding an auditor qualification certificate had reached 1,154. At the end of 2025, the corresponding figures were 175 and 1,296, respectively. In the first quarter of 2026, the number of audit firms reached 176, while the number of auditors increased to 1,337. In 2025, the volume of audit services amounted to UZS 785.77 billion, representing an increase of 31% [2–4]. These dynamics indicate that market capacity is growing and highlight the importance of ensuring that quantitative growth is accompanied by improvements in service efficiency.

The relevance of this issue is associated with the fact that, in practice, the performance of audit firms is often assessed using indicators such as revenue, profit, the number of clients, or the number of engagements completed. A more comprehensive approach would also incorporate audit quality, the share of material errors detected, engagement completion time, staff productivity, the extent to which digital tools are used, and improvements in the client's control environment. Therefore, the aim of this study is to develop a comprehensive approach to assessing the efficiency of audit services provided to business entities and to improve the organizational and economic mechanism designed to enhance their efficiency.

LITERATURE REVIEW

In the international literature, audit quality and efficiency are examined in relation to auditor independence, professional competence, the sufficiency of audit evidence, the quality of risk assessment, and corporate governance [9]. DeAngelo [7] links audit quality to the probability that an auditor will both discover a misstatement in the financial statements and report it appropriately. Francis [8] treats audit quality as a multi-level system and emphasizes the interaction among the audit firm, the engagement team, institutions, and the market environment.

Under International Standards on Auditing (ISAs), a key component of efficiency is the appropriate identification of risks and the design of audit procedures proportionate to those risks. ISA 315 (Revised) [6] focuses on identifying and assessing the risks of material misstatement based on an understanding of the entity and its environment, including its internal control system. This approach helps to concentrate audit resources on high-risk areas, optimize audit procedures, and improve audit effectiveness [10].

In Uzbekistan, the legal basis for audit activity is Law No. O'RQ-677 "On Auditing Activity" of 25 February 2021 [1]. The authorized state body maintains the registers of auditors and audit firms and analyzes the development of the audit services market. Measures adopted in 2025 strengthened the alignment of financial reporting and auditing with international standards, the application of IFRS and ISAs by public interest entities, and the digitalization of the sector.

A synthesis of existing studies reveals three approaches to assessing the efficiency of audit services: the resource approach, the results-based approach, and the quality–risk approach. The resource approach considers labor and time expenditure; the results-based approach considers financial outcomes; and the quality–risk approach considers the reliability of the audit opinion and the risks identified. This study proposes combining these approaches into a single integral assessment system.

RESEARCH METHODOLOGY

The study employs systems analysis, comparative analysis, time-series analysis, the index method, expert assessment, and multi-criteria integral assessment. The information base comprises open data from the Ministry of Economy and Finance of the Republic of Uzbekistan on the audit services market, service-sector statistics from the National Statistics Committee, regulatory and legal acts governing audit activity, and International Standards on Auditing.

To comprehensively measure the efficiency of audit services, an integral index consisting of five blocks is proposed: economic performance (E), service quality (Q), the extent of risk identification and coverage (R), time and labor efficiency (T), and the level of digitalization (D). All indicators are normalized to a range from 0

to 1. The weights are determined through expert assessment based on the principles of the analytic hierarchy process and sum to one:

$$IASE = 0.25E + 0.30Q + 0.20R + 0.15T + 0.10D \quad (1)$$

where $IASE$ is the integral index of audit service efficiency; E is economic performance; Q is audit quality; R is the identification and coverage of risks; T is the efficiency of time and labor use; and D is the degree of digitalization of audit processes. An index value of **0.80–1.00** is interpreted as high, **0.65 to below 0.80** as good, **0.50 to below 0.65** as satisfactory, and **below 0.50** as indicating opportunities for further improvement.

Dynamic indicators are assessed using the chain growth rate:

$$g = (Y_t / Y_{t-1} - 1) \times 100\% \quad (2)$$

where g is the growth rate, Y_t is the indicator for the current period, and Y_{t-1} is the indicator for the previous period.

ANALYSIS AND RESULTS

The main indicators of the institutional capacity of the audit market demonstrate a positive trend. Table 1 is compiled on the basis of official data.

Table 1
Selected Indicators of the Audit Services Market in Uzbekistan¹

Indicator	2023	2024	2025	Q1 2026
Number of audit firms	138	153	175	176
Certified auditors (persons)	1,003	1,154	1,296	1,337
Volume of audit services (UZS billion)	–	–	785.77*	–

Note: *The volume of audit services in 2025 was 31% higher than in 2024.

Between 2023 and 2025, the number of audit firms increased from 138 to 175 (by 26.8%), while the number of auditors increased from 1,003 to 1,296 (by 29.2%), indicating an expansion in the supply capacity of the audit market. The 31% increase in the volume of services in 2025 suggests that demand is also growing. Notably, in 2025, the volume of services grew considerably faster than the number of audit firms (14.4%) and auditors (12.3%), as calculated using Equation (2). Back-calculating the 2024 service volume from the reported growth rate gives approximately UZS 600 billion, implying an increase in average revenue of about 14.5% per audit firm and about 16.6% per auditor. These dynamics may indicate an increase in workload and labor productivity. At the same time, since these indicators are expressed in nominal terms, part of the increase may be associated with price changes; therefore, the conclusion could be further substantiated using firm-level data.

Figure 1 presents the proposed organizational and economic mechanism. Its main distinguishing feature is the integration of pre-engagement diagnostics and final efficiency monitoring into a single management cycle. In practice, the allocation of considerable time to resource-intensive processes involving relatively low levels of material risk may affect the efficiency of resource utilization. Risk-based planning helps optimize this allocation by directing the audit team's time toward high-risk accounts, transactions, and control points.

¹ Source: Author's compilation based on data from the Ministry of Economy and Finance of the Republic of Uzbekistan.

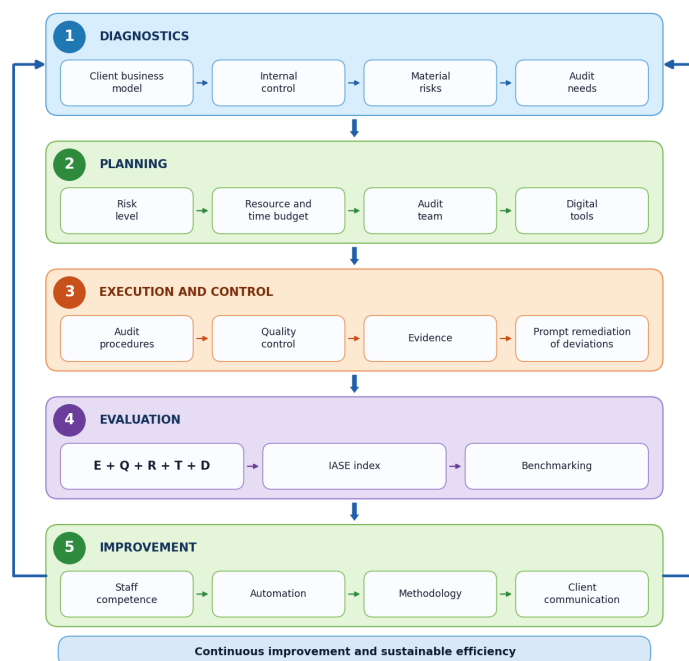


Figure 1. Organizational and Economic Mechanism for Improving the Efficiency of Audit Services²

Table 2 presents an illustrative model for the integral assessment of an audit engagement.

Table 2
Illustrative Model for the Integral Assessment of Audit Engagement Efficiency

Block	Weight	Scenario A	Scenario B	Key content
E – Economic performance	0.25	0.72	0.84	Costs, margin, return on resources
Q – Audit quality	0.30	0.76	0.90	Quality control, evidence, errors
R – Risk coverage	0.20	0.68	0.88	Coverage of material risks
T – Time/labor efficiency	0.15	0.64	0.82	Hours, deadlines, productivity
D – Digitalization	0.10	0.55	0.85	Analytics and automation
IASE	1.00	0.695	0.864	Integral result

Note: Scenarios A and B are hypothetical figures constructed solely to demonstrate the methodology; they should not be interpreted as financial data of any actual audit firm.

In the illustrative calculation, following organizational and technological improvements (Scenario B), the integral index increases from 0.695 to 0.864, moving the engagement from the “good” band to the “high” band. The largest gains occur in the digitalization block (+0.30) and the risk coverage block (+0.20). The practical value of the model lies in enabling management to identify the components of efficiency that have the greatest potential for improvement rather than relying solely on final profit or revenue. For example, if economic performance is high while audit quality requires further improvement, the overall efficiency assessment should take both dimensions into account.

According to the National Statistics Committee, legal and accounting services totaled UZS 4.6 trillion in January–November 2025, of which accounting and financial audit services accounted for approximately UZS 2 trillion, or 43.3% [5]. These figures show that accounting and financial audit services represent a substantial share of the reported legal and accounting services segment. In this environment, an efficiency management system becomes an important factor in strengthening the competitiveness of an audit firm.

The results indicate that assessing the efficiency of audit services using a single indicator provides only a

² Source: Author's development.

partial representation of overall efficiency. Growth in an audit firm's revenue may reflect economic efficiency, but a comprehensive assessment should also incorporate the quality of audit evidence, the likelihood of detecting errors, and the compliance of an engagement with international standards. Therefore, an integral approach combining economic and professional quality indicators is appropriate.

In the proposed IASE index, the largest weight (0.30) is assigned to the quality block, which follows from the economic nature of audit services: the principal value of an audit for the client lies in an independent and reliable professional opinion. Economic performance ranks second, with a weight of 0.25, because the financial stability of an audit firm is necessary for the continuous provision of high-quality services. Risk coverage, time and labor efficiency, and digitalization are treated as enabling factors that support these two principal outcomes.

Digitalization enhances audit efficiency in two ways. First, the ability to analyze large volumes of transactions comprehensively or extensively can reduce reliance on sampling. Second, automating repetitive processes, such as data preparation, reconciliation, and anomaly detection, allows auditors to devote more time to tasks requiring professional judgment. At the same time, digital tools complement rather than replace the auditor's professional skepticism and ultimate responsibility.

From the perspective of the organizational mechanism, it is important to form the audit team in accordance with engagement risk, maintain quality control throughout the process rather than focusing solely on the end of the engagement, compare budgeted hours with actual time expenditure, and conduct a post-engagement review of each assignment. Such a cycle of **"planning – execution – monitoring – analysis – improvement"** establishes a framework for continuous efficiency management within the audit firm.

CONCLUSION AND RECOMMENDATIONS

The study shows that the audit services market in Uzbekistan is expanding both institutionally and quantitatively. The substantial growth in the number of audit firms and auditors during **2023–2025**, together with the 31% increase in the volume of audit services in 2025, indicates rising demand for professional services. The expansion of the market requires audit firms to increase labor productivity and technological efficiency while maintaining service quality. Based on the findings, the following recommendations are proposed:

Introduce the IASE index in practice as a tool for assessing audit efficiency that integrates economic performance, audit quality, risk coverage, time and labor efficiency, and digitalization.

Monitor, for each audit engagement, planned versus actual labor hours, material misstatements identified, the share of rework, the implementation of recommendations issued to the client, and the coverage of digital analytics.

Allocate audit resources using a risk-based approach, assigning experienced auditors and additional time to high-risk areas.

Integrate internal quality monitoring with a digital dashboard so that efficiency indicators can be tracked for each engagement in near real time.

Increase the emphasis on competencies in data analytics, information systems, cybersecurity risks, and International Standards on Auditing in auditors' professional development programs.

Introduce standardized electronic document checklists and deadlines for information exchange between business entities and audit firms, thereby improving the organizational efficiency of the audit process.

The proposed organizational and economic mechanism makes it possible to manage an audit service not merely as the "result of an inspection" but as an interconnected system encompassing resources, risks, quality, technology, and the economic value created for the client.

Future research should test the IASE index econometrically using actual panel data from audit firms in Uzbekistan and refine the weighting coefficients through expert and statistical methods.

REFERENCES

1. Law of the Republic of Uzbekistan No. O'RQ-677. *On Auditing Activity*: adopted on 25 February 2021 [Electronic resource]. – URL: <https://lex.uz/uz/docs/-5307886> . LEX.UZ
2. Ministry of Economy and Finance of the Republic of Uzbekistan. *Report on the Audit Services Market for 2023* [Electronic resource]. – Tashkent, 2024. – URL: <https://gov.uz/oz/imv/sections/view/22103> . O'zbekiston Respublikasi Hukumat portal
3. Ministry of Economy and Finance of the Republic of Uzbekistan. *Report on the Audit Services Market for 2024* [Electronic resource]. – Tashkent, 2025. – URL: <https://gov.uz/oz/imv/sections/view/22103> . O'zbekiston Respublikasi Hukumat portal
4. Ministry of Economy and Finance of the Republic of Uzbekistan. *Information on the Results Achieved in Accounting and Auditing in 2025* [Electronic resource]. – Tashkent, 2026. – URL: <https://gov.uz/oz/imv/news/view/128226> . O'zbekiston Respublikasi Hukumat portal
5. National Statistics Committee of the Republic of Uzbekistan. *Statistics on Legal and Accounting Services* [Electronic resource]. – Tashkent, 2025. – URL: <https://stat.uz/uz/docs/-5307886> . LEX.UZ

- resource]. – Tashkent, 2026. – URL: <https://stat.uz> .
6. International Auditing and Assurance Standards Board (IAASB). *ISA 315 (Revised 2019): Identifying and Assessing the Risks of Material Misstatement* [Electronic resource]. – New York: IAASB, 2019. – URL: <https://www.iaasb.org/publications/isa-315-revised-2019-identifying-and-assessing-risks-material-misstatement> . IAASB
 7. DeAngelo L. E. Auditor Size and Audit Quality // *Journal of Accounting and Economics*. – 1981. – Vol. 3, No. 3. – P. 183–199. – DOI: 10.1016/0165-4101(81)90002-1. – URL: [https://doi.org/10.1016/0165-4101\(81\)90002-1](https://doi.org/10.1016/0165-4101(81)90002-1) . DOI
 8. Francis J. R. A Framework for Understanding and Researching Audit Quality // *Auditing: A Journal of Practice & Theory*. – 2011. – Vol. 30, No. 2. – P. 125–152. – DOI: 10.2308/ajpt-50006. – URL: <https://doi.org/10.2308/ajpt-50006> . Opus at UTS
 9. Knechel W. R., Krishnan G. V., Pevzner M., Shefchik L. B., Velury U. K. Audit Quality: Insights from the Academic Literature // *Auditing: A Journal of Practice & Theory*. – 2013. – Vol. 32, Suppl. 1. – P. 385–421. – DOI: 10.2308/ajpt-50350. – URL: <https://doi.org/10.2308/ajpt-50350> . Maastricht University
 10. Hayes R., Wallage P., Gortemaker H. *Principles of Auditing: An Introduction to International Standards on Auditing*. – 3rd ed. – Harlow: Pearson Education, 2014. – 736 p. – ISBN 978-0-273-76949-1. – URL: <https://books.google.com/books?id=AvSoBwAAQBAJ> .

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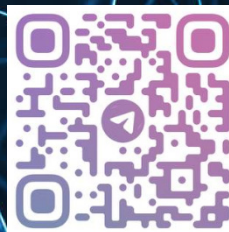
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