

new auditing standards due to changes caused by the influence of blockchain.

Blockchain technology usage requires the adaptation of auditors who will face the consequences of its influence on their professional activities. The study of the needs of auditors in the context of the use of blockchain revealed the need for changes in the operational work of auditors (88,9% of respondents), as well as improvement of IT competencies (88,9% of respondents) and audit methodology (77,8% of respondents). In strategic terms, there is a potential to apply audit tools in real-time and provide services with higher added value, for example, more effective fraud detection, and consulting on the accounting of digital assets. These changes lead to a potential economic effect from the use of blockchain by auditors. According to estimates of the impact of blockchain for the 4 largest audit companies in the world under the basic scenario, an average annual growth rate of 6.9% is expected for the period 2023-2025. This economic effect is an average income of \$72.1 billion per audit company for the projected 2025.

Future research will be concerned with the analysis of directions of strategic and operational changes in auditing under the influence of blockchain in the audit methodology and organizational structure of audit companies.

References

- [1] Turker, I., Bicer, A. How to Use Blockchain Effectively in Auditing and Assurance Services, *Contributions to management science*, Springer, 2019, pp. 457–471, https://doi.org/10.1007/978-3-030-29739-8_22
- [2] Wu, J., Haider, S. A., Bhardwaj, M., Sharma, A., Singhal, P. Blockchain-Based Data Audit Mechanism for Integrity over Big Data Environments, *Security and Communication Networks*, Vol. 2022, 2022, pp. 1–9, <https://doi.org/10.1155/2022/8165653>
- [3] Dong, G., Wang, X. A Secure IoT Data Integrity Auditing Scheme Based on Consortium Blockchain, *2020 5th IEEE International Conference on Big Data Analytics (ICBDA)*, IEEE, 2020, pp. 246–250, <https://doi.org/10.1109/icbda49040.2020.9101201>
- [4] Ahmad, A., Saad, M., Bassiouni, M. A., Mohaisen, A. Towards Blockchain-Driven, Secure and Transparent Audit Logs, *MobiQuitous*, Vol. 18, No. 5-7, 2018, pp. 1–6, <https://doi.org/10.1145/3286978.3286985>
- [5] Nguyen, H., Eisenbarth, J., Ignat, C., Perrin, O. Blockchain-Based Auditing of Transparent Log Servers, *Lecture Notes in Computer Science*, Springer Science+Business Media, 2018, pp. 21–37, https://doi.org/10.1007/978-3-319-95729-6_2
- [6] Belchior, R., Correia, M., Vasconcelos, A. Towards Secure, Decentralized, and Automatic Audits with Blockchain, *Proceedings of the 28th European Conference on Information Systems (ECIS)*, An Online AIS Conference, 2020, [Online] https://aisel.aisnet.org/ecis2020_rp/68 (Accessed Date: 14/8/2023)
- [7] Smith, S. C., Castonguay, J. Blockchain and Accounting Governance: Emerging Issues and Considerations for Accounting and Assurance Professionals, *Journal of Emerging Technologies in Accounting*, Vol. 17, No. 1, 2019, pp. 119–131, <https://doi.org/10.2308/jeta-19-01-22-2>
- [8] Ingle, C., Samudre, A., Bhavsar, P., Vidap, P. Audit and Compliance in Service Management using Blockchain, *2019 IEEE 16th India Council International Conference (INDICON)*, IEEE, 2019, pp. 1–4, <https://doi.org/10.1109/indicon47234.2019.9030369>
- [9] Zhou, F., Wang, X., Yin, L., Tao, L., Chen, D. G. Research on the Application of Blockchain Technology: From the Perspective of Audit, *2021 International Conference on Intelligent Computing, Automation and Applications (ICAA)*, IEEE, 2021, pp. 580–584, <https://doi.org/10.1109/icaa53760.2021.00106>
- [10] Bonyuet, D. Overview and Impact of Blockchain on Auditing, *The International Journal of Digital Accounting Research*, Vol. 20, 2020, pp. 31–43, https://doi.org/10.4192/1577-8517-v20_2
- [11] Yuan, H., Chen, X., Wang, J., Yuan, J., Huang, T., Susilo, W. Blockchain-based public auditing and secure deduplication with fair arbitration, *Information Sciences*, Vol. 541, 2020, pp. 409–425, <https://doi.org/10.1016/j.ins.2020.07.005>
- [12] Rozario, A., Vasarhelyi, M. Auditing with smart contracts, *The International Journal of Digital Accounting Research*, Vol. 18, No. 1, 2018, pp. 1–27, https://doi.org/10.4192/1577-8517-v18_1
- [13] Guan, Z., Lyu, H., Zheng, H., Li, D., Liu, J. Distributed Audit System of SDN Controller Based on Blockchain, *Lecture Notes in Computer Science*, Springer

- Science+Business Media, 2019, pp. 21–31, https://doi.org/10.1007/978-3-030-34083-4_3
- [14] Liu, Z., Feng, Y., Dong, G., Zheng, W. Data Integrity Audit Scheme Based on Blockchain Expansion Technology, *IEEE Access*, Vol. 10, 2022, pp. 55900–55907, <https://doi.org/10.1109/access.2022.3176754>
- [15] Du, Y., Duan, H., Zhou, A., Wang, C., Au, M. H., Wang, Q. Towards Privacy-assured and Lightweight On-chain Auditing of Decentralized Storage, *40th IEEE International Conference on Distributed Computing Systems*, IEEE, 2020, pp. 1–11, <https://doi.org/10.1109/icdcs47774.2020.00023>
- [16] Cao, S., Cong, L. W., Han, M., Hou, Q., Yang, B. Blockchain Architecture for Auditing Automation and Trust Building in Public Markets, *IEEE Computer*, Vol. 53, No. 7, 2020, pp. 20–28, <https://doi.org/10.1109/mc.2020.2989789>
- [17] Regueiro, C., Seco, I., Gutierrez-Aguero, I., Urquizu, B., Mansell, J. A Blockchain-Based Audit Trail Mechanism: Design and Implementation, *Algorithms*, Vol. 14, No. 12, 2021, pp. 341–357, <https://doi.org/10.3390/a14120341>
- [18] Li, J., Wu, J., Jiang, G., Srikanthan, T. Blockchain-based public auditing for big data in cloud storage, *Information Processing and Management*, Vol. 57, No. 6, 2020, pp. 102382, <https://doi.org/10.1016/j.ipm.2020.102382>
- [19] Zhou, X., Nehme, A., Jesus, V., Wang, Y., Josephs, M. B., Mahbub, K. Towards Blockchain-Based Auditing of Data Exchanges, *Lecture Notes in Computer Science*, Springer Science+Business Media, 2019, pp. 1–10, https://doi.org/10.1007/978-3-030-34083-4_5
- [20] Chen, H., Zhou, H., Yu, J., Wu, K., Liu, F., Zhou, T., Cai, Z. Trusted audit with untrusted auditors: A decentralized data integrity Crowdauditing approach based on blockchain, *International Journal of Intelligent Systems*, Vol. 36, No. 11, 2021, pp. 6213–6239, <https://doi.org/10.1002/int.22548>
- [21] Assiri, M., Humayun, M. A Blockchain-Enabled Framework for Improving the Software Audit Process, *Applied Sciences*, Vol. 13, No. 6, 2023, pp. 3437, <https://doi.org/10.3390/app13063437>
- [22] Ermolaev, V., Klangberg, I., Madhwal, Y., Vapper, S., Wels, S., Yanovich, Y. Incorrutable Auditing: Blockchain-Powered Graph Database Management, *2020 IEEE International Conference on Blockchain and Cryptocurrency (ICBC)*, IEEE, 2020, pp. 1–3, <https://doi.org/10.1109/icbc48266.2020.9169431>
- [23] Anadolu University. The Impact of Blockchain Technology on Accounting, Auditing and Assurance Practices, 2023, [Online] <https://www.igi-global.com/chapter/the-impact-of-blockchain-technology-on-accounting-auditing-and-assurance-practices/323235> (Accessed Date: 14/8/2023)
- [24] IAASB. The IAASB’s Consultation Paper Proposed Strategy and Work Plan for 2024–2027, 2023, [Online] <https://www.iaasb.org/sites/default/files/2023-04/Final%20Submission%20to%20IAASB%20-%20April%2011%2C%202023.pdf> (Accessed Date: 14/8/2023)
- [25] AICPA – CIMA. CPAs Explore Evolving Role in the Audit, 2020, [Online] <https://www.aicpa-cima.com/news/article/new-ai-white-papers-for-cpas-explore-evolving-role-in-the-audit> (Accessed Date: 14/8/2023)
- [26] ISACA. An IT General Controls-Based Audit Approach for Blockchain, 2021, [Online] <https://www.isaca.org/resources/news-and-trends/isaca-now-blog/2021/an-it-general-controls-based-audit-approach-for-blockchain> (Accessed Date: 14/8/2023)
- [27] EY. How Blockchain Could Introduce Real Time Auditing, 2016, [Online] https://www.ey.com/en_gl/assurance/how-blockchain-could-introduce-real-time-auditing (Accessed Date: 14/8/2023)
- [28] CBInsights. State of Blockchain Global Report, 2022, [Online] <https://verimedia.io/wp-content/uploads/2023/02/state-of-blockchain-cbi.pdf> (Accessed Date: 14/8/2023)
- [29] Statista. Average cost of a data breach in the United States from 2006 to 2022, 2022, [Online] <https://www.statista.com/statistics/273575/us-average-cost-incurred-by-a-data-breach/> (Accessed Date: 14/8/2023)
- [30] Statista. Revenue of the Big Four accounting / audit firms worldwide in 2022, 2022, [Online] <https://www.statista.com/statistics/250479/big-four-accounting-firms-global-revenue/> (Accessed Date: 14/8/2023)
- [31] Kryshchanovych, M., Akimova, L., Akimov, O., Kubiniy, N., Marhitich, V. Modeling the

process of forming the safety potential of engineering enterprises. *International Journal of Safety and Security Engineering*, Vol. 11, No. 3, 2021, pp. 223-230.

<https://doi.org/10.18280/ijss.110302>

- [32] Prokopenko, O., Kurbatova, T., Khalilova, M., Zerkal, A., Prause, G., Binda, J., Berdiyrov, T., Klapkiv, Y., Sanetra-Pógrabi, S., Komarnitskiy, I. Impact of investments and R&D costs in renewable energy technologies on companies' profitability indicators: Assessment and forecast. *Energies*, Vol. 16, No. 3, 2023. <https://doi.org/10.3390/en16031021>
- [33] Abu Afifa, M. M., Vo Van, H., Le Hoang Van, T. Blockchain adoption in accounting by an extended UTAUT model: empirical evidence from an emerging economy. *Journal of Financial Reporting and Accounting*, Vol. 21 No. 1, 2023, pp. 5-44. <https://doi.org/10.1108/JFRA-12-2021-0434>
- [34] Saleh, I., Marei, Y., Ayoush, M, Abu Afifa, M. M. Big Data analytics and financial reporting quality: Qualitative evidence from Canada. *Journal of Financial Reporting and Accounting*, Vol. 21 No. 1, 2023, pp. 83-104. <https://doi.org/10.1108/JFRA-12-2021-0489>

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