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Forensic Accounting in the Digital Era: Modern Technologies in the Detection of Financial Fraud

Abstract: *The transformation driven by business digitalization has reshaped all aspects of the financial system, particularly the methods used to detect and prevent financial fraud. Forensic accounting, an interdisciplinary field uniting finance, law, and technology, has emerged as a fundamental mechanism for safeguarding market integrity and public trust. In an era where data represents the most valuable asset, technological innovations such as artificial intelligence, blockchain, digital forensics, and big data analytics have become essential in identifying irregularities and reconstructing financial flows. Their integration not only enhances fraud detection techniques but also redefines the very notion of professional accountability in financial reporting. This paper explores the evolving role of forensic accounting as a discipline that harmonizes the traditional principles of accuracy and reliability with the transformative potential of digital technologies.*

Keywords: *forensic accounting, financial fraud, digital forensics, blockchain, artificial intelligence, data analytics.*

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INTRODUCTION

Forensic accounting is a discipline that deals with the identification, prevention, analysis and investigation of financial frauds that are increasingly prevalent, sophisticated and difficult to detect in the modern business environment. Forensic accounting combines elements of accounting, auditing, law, and more recently, information technology in one discipline. Forensic accounting plays a key role in the detection and prevention of financial fraud, using methods such as data analysis and digital forensics to identify irregularities (A.M. Ali et al., 2024). Although the theory of forensic accounting is a relatively new discipline, it is noticeable that the practice in the digital environment is developing much faster, which indicates the need for scientific and professional frameworks to be adapted to the dynamics of modern business processes (Vukadinović & Damnjanović, 2016).

The digital era, when it comes to finance in general, brings with it numerous benefits, but the intensive digitalization of business processes also means an increased volume and new forms of financial manipulation. The development of various financial platforms, tokenization, cryptocurrencies, electronic payment systems, large data exchange systems, automated investment advisory systems and similar technologies has created new space for abuses, and for the creation of increasingly difficult to detect fraud systems. In order to detect these illegal actions, which are constantly evolving, it is necessary to adapt and improve methods for their identification and prevention. Given the increasing incidence of business fraud and the loss of trust in corporate financial reporting, forensic accounting is becoming a key instrument in strengthening transparency and building a system of corporate accountability in the modern business environment (Knežević et al, 2021).

APPLICATION OF BLOCKCHAIN TECHNOLOGY IN FINANCIAL FORENSICS

Blockchain is a decentralized, distributed database where all transactions are recorded in "blocks" that are cryptographically protected and linked, so that all records in the computer network are resistant to unauthorized changes (Hayes, 2025a). One of the basic and most important advantages of this technology lies precisely in the fact that once entered, data cannot be changed or deleted, which means that transaction data is stored long-term and that the space and opportunities for manipulation, abuse, concealment of fraud and traces are reduced to a minimum. Blockchain technology and its tools are most often used in monitoring the flow of money in cryptocurrencies.

One of the best examples of using this technology to detect fraud is a case from 2021 in the United States when the company Colonial Pipeline was the victim of a hacker attack. The hackers blocked all systems and access to the company and demanded that the company pay a certain amount of money in cryptocurrency, in this particular case in bitcoin. In order to regain access to its systems, the company paid over four million dollars in cryptocurrency to the hackers. The FBI was then able to track the movement of this cryptocurrency, thanks

to the public nature of blockchain transactions. During the investigation, the FBI was able to access the wallet containing the majority of the stolen bitcoins and seize these funds.

The application of blockchain in forensic accounting has proven to be very effective so far, especially because the evidence obtained from these analyses is irrefutable because data and transactions can be directly traced. Real-time monitoring uses the integration of multiple technologies that continuously monitor transactions, immediately detect suspicious activity, and respond to potential fraud in an automated manner, significantly increasing the efficiency and speed of detection without compromising the user experience (Tanvir Rahman et al, 2024). This capability significantly facilitates the collection and presentation of evidence in court and allows for the creation of a clear picture of financial flows.

THE ROLE OF DIGITAL FORENSICS IN DATA TRACE ANALYSIS

Digital forensics is one of the most important segments of financial forensics in modern business because it allows the collection, analysis and storage of data traces in the digital environment that can be crucial for detecting fraud. Given that today almost every transaction, information, contract, communication and other business processes leave an electronic trace, favorable opportunities for detecting fraud and perpetrators are opening up more easily than ever before. These opportunities are reflected precisely in the reconstruction of all activities of suspected employees or entire organizations. In the modern technology-based business environment, digital forensics is becoming a key tool for auditors in detecting and preventing fraud by monitoring complex ERP systems and using various digital tools to effectively identify illegal activities inside and outside the organization (Segal, 2016).

One of the main tasks of digital forensics is to determine the security of the network and the existence of unauthorized access, attempts to manipulate data or transactions, illegal money transfers and similar abuses. Also, during the investigation of fraud, digital forensics can recover all deleted data or those that were tried to be hidden and thus provide irrefutable evidence of fraud. Cases from practice show that digital forensics is most successful in investigating and detecting fraud related to cyber attacks and blackmail, identity theft, unauthorized access to sensitive data, internal fraud in financial institutions, fraudulent transactions, phishing, etc.

APPLICATIONS OF COMPUTER ANALYSIS IN PROCESSING LARGE DATA SETS

Traditional forensic accounting methods cannot process large data sets, especially not in a short period of time, especially when considering the number of transactions that are carried out in real time. Big data analytics technologies enable the analysis of various types

of data, structured and unstructured, numerical and non-numerical, textual, image, video, market sentiment, etc. These technologies can be used to detect anomalies and suspicious patterns of behavior that would otherwise likely, if not certainly, be missed by forensic accountants. Although analyses based on these technologies require significant investments, they have proven very effective in sectors such as banking, e-commerce and crypto exchanges, where they have significantly reduced losses from fraud (Udeh et al, 2024).

In practice, various data analysis techniques are used, including data mining, predictive models, business network analysis, real-time data movement monitoring, etc. Research on the application of these tools for detecting financial fraud shows that supervised methods such as logistic regression are most commonly used, and fraud in financial statements and bank fraud are most frequently investigated (Albashrawi, 2016). The application of computational analysis tools for large data sets has so far proven to be efficient and highly cost-effective. A large area for the growth and development of the effectiveness of this technology is its integration with other similar innovative technologies, such as artificial intelligence and machine learning. By crossing these technologies, it would be possible to predict new potential forms of fraud, which would further improve the preventive capacity of financial institutions.

APPLICATION OF ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING TOOLS

Artificial intelligence plays a key role in fraud prevention by analyzing large amounts of data in real time, recognizing unusual patterns in transactions, and automatically detecting and preventing suspicious activities such as money laundering, phishing, and cyberattacks (Bello & Olufemi, 2024). Machine learning techniques find application in various fields, such as network intrusion detection, credit card fraud, and time series analysis, using methods such as neural networks, Bayesian networks, and predictive models (Đorđević et al, 2022).

These technologies enable dynamic learning from data and its analysis that far surpasses human capabilities. Machine learning significantly contributes to the detection of financial fraud by using historical data to train models that can identify potential fraud in real time by analyzing user behavior and spotting anomalies (Sathisha & Sowmya, 2024). Also, the most common application of machine learning is in fraud detection. Machine learning helps classify transactions into those that are suspicious and those that are harmless (Bogojević Arsić, 2021).

These technologies can be used to monitor customer behavior and transactions in real time in the banking sector. Also, if such models detect an attempt at unauthorized or suspicious access to data or accounts, they can request additional authentication to prevent potential fraud. Artificial intelligence and machine learning are also widely used in fraud prevention in the cryptocurrency market by searching for fund flows, suspicious transactions and wallets and mapping them to track the flow of stolen cryptocurrency if this occurs. A particular advantage of these systems is that they continuously learn from

the examples they have processed and improve themselves so that, over time, the number of cases that are incorrectly labelled as fraud decreases.

The tools of these technologies are extremely powerful and effective, but they also come with certain risks and challenges. One of the main problems with these technologies is that they are considered "black boxes", meaning that it is not known how exactly they work, what logic they use and what decisions they make. Transparency is something that can be a problem in court because it is difficult to explain how certain findings and conclusions were reached.

CHALLENGES AND LIMITATIONS OF TECHNOLOGY APPLICATION

The implementation of complex technologies requires a reliable infrastructure to prevent system downtime or malfunctions and errors that can lead to negative consequences. Due to the large amounts of data that are stored and processed, there is a fear of unauthorized access to them. Also, one of the biggest problems is the lack of standardization in the application of new technologies, as different accounting systems use different software or models that are not compatible. In addition, the costs of implementing, developing and maintaining these systems are extremely high, and for smaller organizations they often represent the biggest obstacle. Data quality and availability a challenges common to all systems based on these technologies, as their operation directly depends on them, and in practice, incomplete, inaccurate or outdated data can often be found.

Innovative technologies are often born before their operation and use are regulated. Collaboration between companies and regulators is crucial as it would allow a wider range of stakeholders to drive innovative legislation to build an ecosystem of financial actors and innovators who will work together to create a more resilient digital financial system (Jarvis & Han, 2021).

The implementation of innovative technologies requires a certain technical infrastructure, but in addition, there is also a problem related to employees. The automation of many processes means that the need for personnel will be reduced, so the fear of losing their jobs is a real problem that employees face. Employees who deal with finance now have to cooperate more with IT specialists and engineers, whose number is increasing in the organizational structure. Given that the accounting profession is continuously changing, it is necessary to constantly improve curricula and integrate forensic accounting into the education system in order to respond to the increasingly complex challenges of the digital age (Knežević et al, 2021).

CONCLUSION

Forensic accounting in the digital era is one of the most dynamic areas of finance. It is no longer just a system for detecting fraud that has already been committed, but is also considered a preventive step. When it comes to risk management, forensic accounting is also gaining a strategic role. What remains a worrying fact is that even with the use of

advanced technology and the expert knowledge of forensic accountants, fraud is occurring on an increasing scale and the root cause of its occurrence is largely constant: the human factor. It is not enough to simply use innovative technologies if they do not respect ethical principles, and regulatory and legal authorities must be more agile in adopting new regulations that govern new technologies. The future of forensic accounting in the digital era lies precisely in the combination of several factors: the implementation of new technologies in the work of regulatory institutions and companies, the development of ethical standards, and international cooperation in the issue of adopting standards and legal frameworks. Education of forensic accountants regarding new forms of fraud, as well as the development of new tools and technologies, is also a step that must be continuously implemented.

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forenzičko računovodstvo u digitalnoj eri: Savremene tehnologije u detekciji finansijskih prevara

Apstrakt: *Duboke promjene koje su nastale digitalizacijom poslovanja uticale su na sve segmente finansijskog sistema, posebno na načine otkrivanja i sprečavanja finansijskih prevara. Forenzičko računovodstvo, kao disciplina koja objedinjuje finansije, pravo i tehnologiju, postalo je jedan od ključnih mehanizama očuvanja integriteta tržišta i povjerenja javnosti. U eri u kojoj su podaci najvredniji resurs, savremeni tehnološki alati poput vještačke inteligencije, blokčejna, digitalne forenzike i analize velikih skupova podataka postaju nezaobilazni u identifikaciji nepravilnosti i rekonstrukciji finansijskih tokova. Njihova primjena mijenja ne samo tehnike otkrivanja prevara, već i sam koncept profesionalne odgovornosti u finansijskom izvještavanju. Rad ukazuje na nove pravce razvoja forenzičkog računovodstva kao discipline koja spaja tradicionalne principe tačnosti i pouzdanosti sa mogućnostima koje nudi digitalna era.*

Ključne riječi: *forenzičko računovodstvo, finansijske prevare, digitalna forenzika, blokčejn, vještačka inteligencija, analiza podataka.*