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FIGHTING FINANCIAL FRAUD IN THE AZERBAIJANI BANKING SYSTEM: INTERNATIONAL COMPARISONS AND BEST PRACTICES

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ПРОТИДІЯ ФІНАНСОВОМУ ШАХРАЙСТВУ В БАНКІВСЬКІЙ СИСТЕМІ АЗЕРБАЙДЖАНУ: МІЖНАРОДНІ ПОРІВНЯЛЬНІ ПІДХОДИ ТА ПЕРЕДОВІ ПРАКТИКИ

This article analyses the financial fraud state of the Azerbaijani financial (banking) system and providing a comparison with developed countries state such as United States or European countries. The article starts with providing information about the current state of financial fraud in Azerbaijan by analysing the open sources, as well as the official reports. Main data for comparison is report about financial fraud statistics in Q1 and Q2 of 2025 in Azerbaijan by Central Bank of Azerbaijan. International best practices analyzed through research papers that support machine learning models where high success rate is observed to determine the fraud transactions in the financial system. Overall, up to 99% success was achieved through fine-tuning of the models in machine learning by international practice. Serious measures have been taken in this direction in recent years.

Article also mentions that, even though there are significant differences between the Azerbaijan Republic fraud statistics and International one, the wide type of different fraud types still not spread in Azerbaijan as in Europe or United States. The main limitation of the article is official statistics by Central Bank of Azerbaijan contains only official reports that is provided by banks is included. Proportion of the people who faced with financial fraud but did not alert the banks is not included and it is assumed it has a significant proportion on the statistics.

The article also proposes that strong data governance is a key domain for increasing the efficiency of the financial fraud scenarios where clean data is an important factor to determine fraud transaction with the minimum amount of false positives. After data cleaning Advanced machine learning models such as Random Forest, Gradient Boosting Machine and etc. could be applied.

Overall, this research aims to investigate the current situation of fraud prevention mechanisms existing in the Azerbaijan banking ecosystem, as well as evaluating real statistics and cases of the fraud and then comparing it with evidence-based international methods of the developed world.

У цій статті аналізується стан фінансового шахрайства у фінансовій (банківській) системі Азербайджану та проводиться порівняння з розвиненими країнами, такими як Сполучені Штати Америки чи європейські країни. Стаття починається з надання інформації про поточний стан фінансового шахрайства в Азербайджані шляхом аналізу відкритих джерел, а також офіційних звітів.

Основними даними для порівняння є звіт Центрального банку Азербайджану про статистику фінансового шахрайства за 1-й та 2-й квартали 2025 року в Азербайджані. Найкращий міжнародний досвід аналізується за допомогою дослідницьких робіт, що підтримують моделі машинного навчання, де спостерігається високий рівень успішності у визначенні шахрайських операцій у фінансовій системі. Загалом, до 99% успіху було досягнуто завдяки точному налаштуванню моделей машинного навчання згідно з міжнародною практикою. В останні роки в цьому напрямі було вжито серйозних заходів.

У статті також зазначається, що, незважаючи на значні відмінності між статистикою шахрайства в Азербайджанській Республіці та міжнародною, широкий спектр різних типів шахрайства все ще не поширений в Азербайджані так, як у Європі чи у Сполучених Штатах. Основним обмеженням статті є те, що офіційна статистика Центрального банку Азербайджану містить лише офіційні звіти, надані банками. Частка людей, які зіткнулися з фінансовим шахрайством, але не повідомили банки, не включена, і вважається, що вона має значну частку в статистиці.

У статті також пропонується, що надійне управління даними є ключовою сферою для підвищення ефективності сценаріїв фінансового шахрайства, де чисті дані є важливим фактором для виявлення шахрайських транзакцій з мінімальною кількістю помилкових спрацювань. Після очищення даних можна застосовувати передові моделі машинного навчання, такі як Random Forest, Gradient Boosting Machine тощо.

Загалом, це дослідження має на меті дослідити поточний стан механізмів запобігання шахрайству, що існують у банківській екосистемі Азербайджану, а також оцінити реальну статистику та випадки шахрайства, а потім порівняти їх з міжнародними методами розвиненого світу, заснованими на доказах.

Key words: banking system, finance, national economy, regulation, international methods, banking service.

Ключові слова: банківська система, фінанси, національна економіка, регулювання, міжнародні методи, банківські послуги.

INTRODUCTION

Financial fraud is one of the most serious issues that jeopardizes banking systems in general and undermines their stability and the integrity of their systems globally. In Azerbaijan, as in many transitional economies, the speed of economic development and digitalization creates possibilities and dangers. From 2024 to 2025, the Azerbaijani banking industry was threatened by historic levels of fraud; it reported a cyber fraud loss of more than 22 million manats in 2024 and over 6 million manats in the first four months of 2025 alone [6]. More concerning still, as of October 2025, the annual incidence of financial fraud was projected to reach 40 million [17].

This exponential evolution highlights the urgent demand for comprehensive advanced fraud detection tools, both technological and systemic, that are in conformity with international industry best principles but are able to cater for the peculiar weakness of the banking sector of Azerbaijan. The Central Bank of Azerbaijan and the Financial Monitoring Service (FMS) have not waited for the time to come to address this urgency and begun systemic reforms: for example, by implementing one central digital fraud detection mechanism and harmonizing the relationship between the financial services and the law enforcement authorities. As a result of these developments, Azerbaijan's fraud detection capabilities remain significantly poorer than those for developed financial systems in both the EU and the US, which have placed heavy investments on artificial intelligence, machine learning, and regulatory frameworks over the last two decades.

ANALYSIS OF RECENT PUBLICATIONS ON THIS TOPIC

In his work, Abdullayev K.N. noted the influence of the banking and financial sector on the development of the non-oil sector [2]. A study of the current situation in the Azerbaijani banking ecosystem revealed serious problems in this area. Furthermore, the fact that the development of the digital economy plays a significant role in ensuring the security of the country's banking and financial sector was scientifically substantiated [4].

In her study, Korsunskaya M. noted the need to improve the efficiency of companies' use of banking services [16]. It should be noted that studying problems in the banking sector is considered relevant worldwide. Abbott L.J. noted in his work that improving the quality of internal audit leads to more accurate financial reporting [1]. Akgul M. noted in his study that eliminating problems in the financial sector leads to the dynamic development of the banking system [3]. Bonrath A. noted the need to utilize international experience when implementing audit services in the banking system [9].

STATEMENT OF THE MAIN MATERIAL

Banking services market in Azerbaijan faces growing fraud epidemic that warrants a swift corrective action. The latest figures indicate a disturbing trend: in 2024, cyber fraud resulted in direct losses exceeding 22 million manats to Azerbaijani people [17]. This is not only a cost of operating data but is also an important measure of systemic weakness of the country's digital payment system. As of 2025, it had grown even worse and estimated that the occurrence of financial fraud would rise to as many as 40 million fraud incidents by year-end, a staggering increase from 22 million total in 2024 [6]. To put this skyrocketing phenomenon into perspective, one criminal network of organized crime was brought down by Azerbaijan after conducting a highly complex fraud and money-laundering operation in Oct 2025 that caused losses over 81.5 million manats (about $48 million USD). The attack was a representative of the increasing sophistication of fraud methods with the criminal organization using the names of more than 300 socially vulnerable individuals to create 777 companies and 103 sole proprietorships who acted as the foundation to carry out illusory financial transactions and to make money laundering transactions. The scheme led to recorded state budget losses over 8 million manats due to systematic tax evasion [8]. The landscape of financial fraud in Azerbaijan encompasses diverse methodologies, though certain patterns have emerged as particularly prevalent. Cyber fraud, including phishing attacks and fraudulent email campaigns impersonating legitimate banking institutions, has become endemic in the Azerbaijani banking environment [19]. These social engineering attacks exploit customer trust and technical vulnerabilities to capture sensitive banking credentials and authentication information.

A third important vulnerability is payment fraud in digital format. With the increasing digitalization and availability of the cashless sector, Azerbaijani payment fraud tactics have increased significantly. Reports of the Central Bank of Azerbaijan report significantly more fraudulent card transactions, account takeovers, and unauthorized payment initiations at domestic and cross-border levels [20].

Money laundering and embezzlement scandals, like the 81.5 million manat criminal network mentioned above, show how organized crime can target Azerbaijan's banking infrastructure to transfer illicit funds. They often include the establishment of shell companies, false business records, and intentional use of cracks in the regulatory framework related to customer due diligence procedures [8].

In November 2025, the Central Bank of Azerbaijan announced a paradigm shift: a national system for fighting digital fraud [7]. Still in the planning stages, this system is designed to put in place automated data interchange among banks, payment systems, and law enforcement agencies, thereby enabling us to detect fraud detection in real time and manage risk in an accurate way. The architecture proposed fills a significant void in the history whereby independent reports regarding fraud reported to banks or the police failed to compile a complete picture and allowed incidents of fraud to be lost because complaints were between institutions [7].

The Central Bank has formed a working group with members from the Ministry of Internal Affairs and the banking sector, which is concentrating on the empowerment of information and the development of cybersecurity in the digital financial sector, prevention, and coordinated action based on the best international practices [20]. Azerbaijan's payment infrastructure, meanwhile, as a whole had incorporated the ISO 20022 messaging standard, enhancing interoperability with international payment networks and enhancing fraud detection [18].

INTERNATIONAL BEST PRACTICES IN FRAUD PREVENTION

European banks have invested heavily in sophisticated fraud detection infrastructure. We will examine payment fraud patterns from 2024 and find key performance indicators: there were 5.57 detected fraud cases per 100,000 transactions on the European continent, a 43% increase from the 2023 figures [21]. As alarming as this increase may be, it shows how detection systems can spot fraudulent activity en masse. Of particular consequence, social manipulation scams surged 156 percent for European banks as of 2024, whereas phishing cases increased by 77 percent in 2024 from 2023 [21]. European banks have coped by employing multiple levels of technological insulation. UK banks have, for instance, developed powerful behavioral profiling systems that track device features, payment balances, biometric activities, and transaction destinations to detect dubious bank activity [11].

U.S. financial institutions have become leaders in utilizing advanced analytics for fraud detection. A well-researched approach that studies transactional data from five leading American banks for the entire period (2022-2024) showcases the positive effect of advanced analytics (e.g., machine learning, anomaly detection, and natural language processing). The findings were significant: fraud detection accuracy rose from 74 percent to 93 percent, and false alarms fell by 48 percent [22]. Unsupervised anomaly detection models were able to detect new types of fraud missed by conventional systems in 70% of cases [22]. Natural language processing tools produced an F1-score of 0.89 for analyzing suspicious transaction narrative patterns, including signs of fake companies, ambiguous beneficial ownership, and high-risk jurisdictions [22]. Moreover, a correlation study found that the ($r = 0.88$) level of significance association

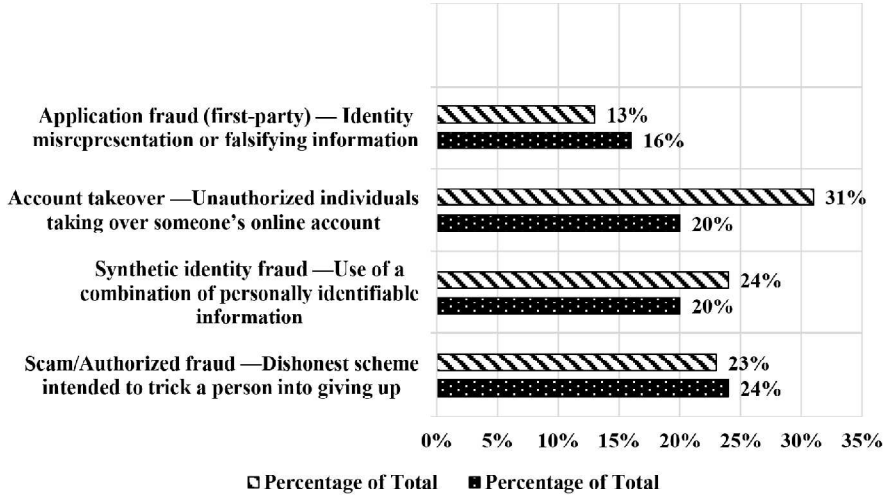

Figure 1. U.S fraud rate comparison with global rate

Source: TransUnion business survey — https://newsroom.transunion.com/h2-2025-global-fraud-report/

between the model risk scores and the actual fraud ($p < .001$), representing a very strong correlation between the predictive models or systems and the actual fraud outcomes.

COMPARATIVE ANALYSIS AND TECHNOLOGICAL INNOVATION

Meta-analysis of the effectiveness of current AI-driven fraud detection approaches identifies detection rates ranging from 87—94 percent and a 40—60 percent decrease in false positives, compared with rule-based practices [10]. Improved implementations are remarkable: for instance, a neural network architecture in a blockchain-enabled fraud detection system achieves 99.1% accuracy, 98.6% precision, 98.9% recall, and 98.7% F1-scores [15].

Gradient Boosting Machine architectures have reported accuracy rates of 96.3 percent, precision of 93.5 percent, recall of 91.4 percent, and an AUC-ROC of 97.2 percent [8]. It is known that ensemble methods making use of several algorithmic perspectives can continuously outperform single models. The Hybrid Autoencoder-XGB-SMOTE-CGAN models reported the highest efficiency of 98 percent in banking fraud detection literature [23]. In real banking systems, Random Forest models achieved 100% accuracy for legitimate transactions and 95.79% accuracy for fraud detection [10].

U.S. banks experienced 9.8 percent of equivalent revenue in fraud losses, representing 46 percent increase from prior year and 27 percent above global average [14]. However, the U.S. represents the benchmark for fraud detection sophistication through comprehensive legal frameworks, advanced AI deployment, and regulatory coordination The analysis shows that authorized fraud was 23% in America and 24% in global (Figure 1).

EU institutions reported 5.57 detected fraud cases per 100,000 transactions in 2024, representing effective detection capability despite 43 percent year-over-year increase in attempts [10]. However, emerging fraud types including deep fake voice impersonation, AI-generated phishing emails, and QR code scams have made fraud detection substantially more challenging (Figure 2) [21].

Azerbaijan: Central Bank of Azerbaijan shared digital payment fraud statistics in November 2025 for the Q1 and Q2. This statistic contains a limitation where it includes the data that banks provided from verified cases. Unverified cases considered to be much higher where different sources imply that in 2024 direct losses was around 22 million manat because of the cyber frauds.

Azerbaijan Banks Association formed expert group in 2025 to fight digital frauds and to increase the efficiency to identify the cases faster before it spread wide. As a

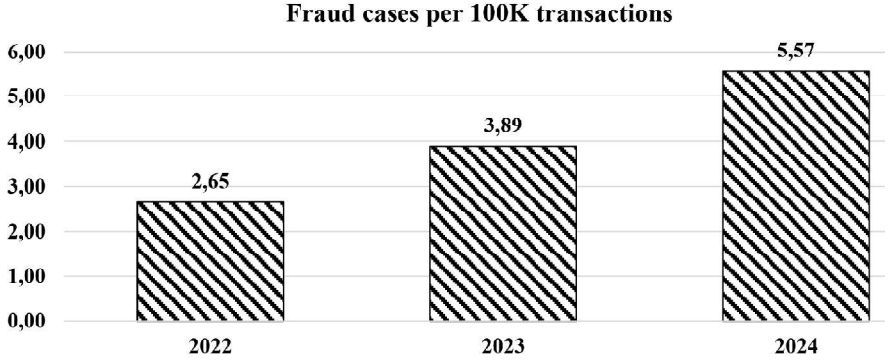

Figure 2. Payment fraud across Europe

Source: Tietoevry Banking's Payment Fraud Report — https://www.tietoevry.com/en/newsroom/all-news-and-releases/press-releases/2025/04/tietoevry-bankings-new-insight-report-reveals-an-increase-in-digital-payment-fraud-in-europe/

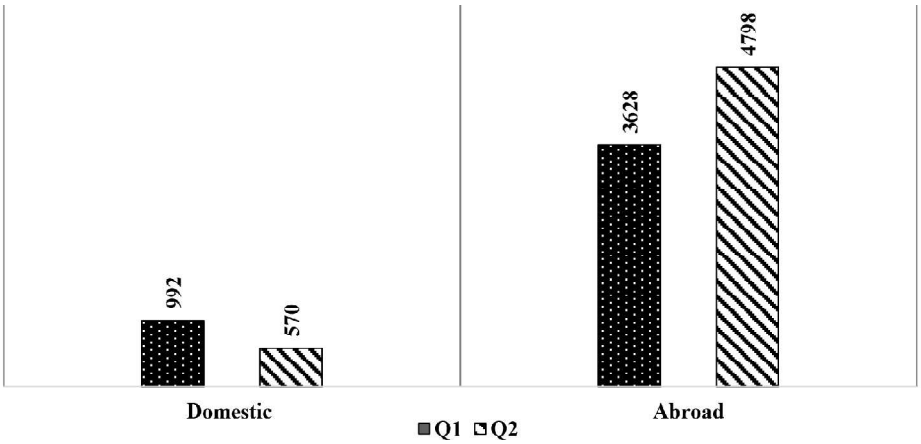

Figure 3. Central Bank of Azerbaijan Fraud Statistics Report (fraud cases count)

Source: Digital Fraud Statistics of Central Bank of Azerbaijan — 2025 — https://uploads.cbar.az/assets/6c136fad575d5457f608cba34.pdf

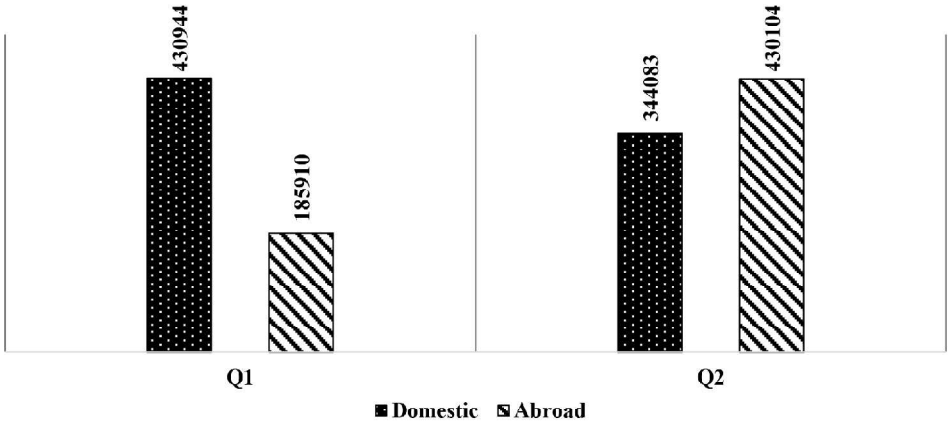

Figure 4. Central Bank of Azerbaijan Fraud Statistics Report (fraud cases total amount)

Source: Digital Fraud Statistics of Central Bank of Azerbaijan — 2025 — https://uploads.cbar.az/assets/6c136fad575d5457f608cba34.pdf

result, we can see there is a decrease in the total amount, but increase in the count of the fraud cases (Figure 3).

A significant change has been observed in the total number of fraud cases in the Fraud Statistics Report of the Central Bank of Azerbaijan (Figure 4). Domestic cases almost equal as cases occurred abroad. But it also means, citizens in Azerbaijan are not much targeted as in the United States. As we can see data mainly covers payment fraud statistics, but in the United States there are wide type of the fraud cases and numbers much higher.

CONCLUSION

According to the comparative analysis of internationally high-quality models together with the particular analysis of the Azerbaijani fraud statistics, a set of strategic recommendations should be proposed [17].

Accelerate Centralized Digital Fraud Detection System Implementation: The Central Bank's desired centralized system would be a vital infrastructure and should accelerate the development and application of the system. The system will need to allow real-time sharing of information among banking companies, payment service providers, and law enforcement agencies, as well as have standardized data protocols, making it compatible.

Invest in Advanced Machine Learning Infrastructure: Azerbaijan should place its priorities in deploying machine learning-based fraud detection systems in big commercial banks. Pilot programs should test Random Forest, Gradient Boosting Machine, and LSTM neural network models on representative transaction datasets, so that performance benchmarks can be established and operational feasibility assured [18]. Strengthen Data Governance Frameworks: Azerbaijan's banking system will require comprehensive data governance laws and policies to be created and implemented. They will define a set of data quality, preprocessing, as well as model validation methods that conform to standards provided by international best practices.

Establish Inter-Agency Coordination Mechanisms: Establish formal coordination measures between the Financial Monitoring Service, the Ministry of Internal Affairs, the Central Bank, and commercial banks, and formal, coherent rules for inter-ministerial agreements should be put in place and implemented. Regular information-sharing meetings as well as joint case reviews would enhance such an effective investigation.

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