COGNITIVE RISK-ORIENTED CONTROL OF TRADE RECEIVABLES UNDER THE DIGITAL TRANSFORMATION OF ACCOUNTING

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DOI: https://doi.org/10.30525/978-9934-26-715-4-10

Abstract. The digital transformation of the economy is changing the role of accounting. Traditional methods of recording trade receivables remain largely retrospective and no longer provide timely support for credit-risk management. This chapter examines the methodological foundations of accounting for and control of trade receivables under conditions of digital transformation. The subject of the research is the development of cognitive risk-oriented control of trade receivables. The study focuses on the integration of formal accounting standards with continuous monitoring, predictive analytics and artificial intelligence tools. *The purpose* of the paper is to develop the concept of cognitive risk-oriented control and to propose a model of a dynamic accounting–management continuum. This continuum links regulatory accounting procedures with continuous monitoring and predictive analytics within a single information environment. The concept treats accounting data not only as a basis for retrospective reporting but also as a continuously updated information base for forward-looking credit-risk assessment and managerial decision-making. *The methodology* of the study combines theoretical and empirical approaches. It draws on contemporary accounting theory, the principles of risk-oriented management, the requirements of Ukrainian Accounting Standard 10 and IFRS 9, and current research on the digital transformation of accounting. Systems analysis, comparative analysis, synthesis and modelling techniques are used to structure the concept and the continuum model. The empirical component is based on the financial and operational

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data of the Ukrainian wholesale trading enterprise ATIF LLC for the period 2021–2025. A six-month pilot implementation of the proposed two-layer model was conducted. Economic assessment employs standard investment-appraisal indicators, including return on investment, net present value and payback period. Scenario modelling tests the resilience of the results under different assumptions. Elements of machine learning support the estimation of default probabilities and early-warning indicators. *The results* show that the proposed concept and model do not contradict existing accounting standards. They extend the functional capabilities of accounting by enabling continuous monitoring, adaptive forecasting of credit risk and the generation of managerial recommendations. The pilot at ATIF LLC demonstrated measurable improvements: the average overdue period shortened, the share of overdue receivables declined, and forecast accuracy reached 84.2 per cent. Economic assessment indicated a positive net cash effect arising mainly from faster working-capital turnover. Scenario modelling confirmed that the net present value remained positive under optimistic, baseline and pessimistic conditions. The two-layer model preserves the regulatory reliability and auditability of formal accounting while adding predictive capability. The conservative accounting layer ensures compliance with standards. The cognitive analytical layer generates early signals and ranked recommendations. Final decisions remain with managers. The approach reduces the information gap between financial reporting and operational credit-risk management. *Practical implications* include the possibility of earlier identification of rising credit risk, more efficient use of working capital and better alignment between accounting, finance and sales functions. The value of the research lies in the systematic integration of regulatory accounting requirements with continuous digital analytics and artificial intelligence tools. The proposed model offers a coherent methodological basis for the further development of accounting under conditions of digital transformation. Limitations related to data quality, model explainability and the single-enterprise pilot setting are acknowledged and point to directions for future multi-enterprise and longitudinal studies.

INTRODUCTION

The digital transformation of the economy is changing both the technologies used in business operations and the ways accounting information is generated, processed and applied. Artificial intelligence, big data analytics, cloud services and integrated ERP/CRM systems allow enterprises to analyse processes in near real time. As a result, accounting is gradually moving from a predominantly retrospective recording function towards continuous information support for managerial decision-making [1, p. 12–18; 2, p. 92–95].

Trade receivables occupy a sensitive position in this shift. They represent an asset, a sales-stimulation instrument and a major source of credit risk. Extending trade credit supports revenue growth. At the same time it exposes firms to payment delays, defaults, liquidity pressure and weakened financial stability. Under conditions of high economic volatility, geopolitical risks and unstable supply chains, traditional accounting procedures no longer supply management with sufficiently timely analytical support. They cannot identify changes in credit risk quickly enough or help adjust credit decisions in good time [3, p. 35–38; 4, p. 75–82].

Ukrainian Accounting Standard 10 «Accounts Receivable» was developed in an environment of predominantly documentary record-keeping and relative economic stability [5]. It rests on the prudence principle, documentary substantiation, periodic control and largely retrospective assessment of non-recovery risk. International practice has advanced further. IFRS 9 Financial Instruments replaced the incurred-loss model with an expected credit loss (ECL) approach. This approach incorporates historical experience, current conditions and forward-looking information [6]. Even the ECL model, however, remains oriented primarily towards the faithful representation of information in the financial statements. It is not designed for continuous, operational credit-risk management in a digital environment.

Ukrainian research has examined the organisational and methodological foundations of receivables accounting under Standard 10. It has addressed recognition and measurement criteria, allowance formation and internal-control procedures [7, p. 2–5; 8, p. 56]. Comparative studies have highlighted differences between Standard 10 and IFRS 9 in the timing and measurement of impairment [7, p. 3–4]. Parallel work has considered the organisation

of accounts-receivable accounting within risk-management systems [3, p. 35–41] and the impact of automation on accounting and analytical support [9, p. 92–97]. International literature has focused on the transition from the incurred-loss model to the ECL model, the construction of provision matrices and the incorporation of forward-looking information. A separate stream has developed continuous auditing and continuous monitoring. These studies show how artificial intelligence, machine learning and anomaly-detection techniques can move assurance from periodic sampling to ongoing assessment of entire transaction populations [10; 11]. Research on the digital transformation of accounting documents the influence of big data, robotic process automation and artificial intelligence on processes and on the accountant's role. It also identifies persistent challenges of algorithmic transparency, explainability and data security [1, p. 15–25; 2, p. 93–96]. Predictive-analytics studies demonstrate that combinations of historical transaction data, behavioural indicators and macroeconomic variables can generate earlier warnings of payment deterioration than traditional ageing analysis [4, p. 80–88].

Despite these advances, the systematic integration of the regulatory framework for trade receivables with cognitive technologies remains underdeveloped. Existing approaches tend either to stay within the boundaries of financial-reporting requirements or to treat digital tools as separate managerial instruments. The resulting separation produces information duplication, higher processing costs and persistent gaps between the accounting function and operational credit-risk control.

This study therefore develops the methodological foundations of accounting for and control of trade receivables. It does so by substantiating the concept of cognitive risk-oriented control. Cognitive risk-oriented control is understood as an integrated system. It combines the reliability and auditability requirements of formal accounting standards with continuous monitoring, predictive analytics and risk-oriented decision-support tools. It treats accounting data not only as a basis for retrospective reporting. It also treats them as a continuously updated information substrate for forward-looking credit-risk assessment and managerial action.

The aim of the work is to develop this concept and to propose a model of a dynamic accounting–management continuum. The continuum

links regulatory accounting procedures with continuous monitoring and predictive analytics.

To achieve the aim the following objectives are pursued:

– to examine the conceptual contradictions between the traditional system of accounting for trade receivables and the requirements of risk-oriented management;

– to analyse the potential of digital technologies for enhancing accounting and credit-risk management systems;

– to develop the concept of cognitive risk-oriented control of trade receivables;

– to propose a model of a dynamic accounting–management continuum;

– to test the proposed model empirically and assess its practical and economic effectiveness.

The theoretical and methodological basis comprises contemporary accounting theory, the concept of risk-oriented management, the provisions of IFRS 9, the requirements of Ukrainian Accounting Standard 10, and current approaches to the digital transformation of accounting systems. Systems analysis, analysis and synthesis, comparative method and modelling techniques were employed. Economic analysis, scenario modelling and standard investment-appraisal techniques (ROI, NPV, payback period) were used to assess practical applicability. Elements of machine learning were applied for credit-risk forecasting.

The empirical component draws on the operational data of the Ukrainian trading enterprise ATIF LLC. These data serve to test the proposed concept and continuum model under real business conditions. They also help evaluate their potential impact on the effectiveness of trade-receivables management. In this way the theoretical construction is linked directly to observable operational outcomes.

1. Conceptual Contradictions in Receivables Accounting

The digital economy is changing the information requirements of enterprise management. Accounting has traditionally focused on the reliable recording of past transactions. Contemporary conditions, however, demand information that can also forecast financial risks and support decisions in real time [1, p. 12–18; 2, p. 92–95].

This tension is especially visible in the accounting for trade receivables. Receivables are a major current asset that supports sales through the extension of trade credit. At the same time they constitute a significant source of financial risk linked to non-recovery, reduced liquidity, higher working-capital needs and cash-flow gaps [3, p. 35–38; 4, p. 75–82].

The existing methodology was formed in an environment of slower information flows, geographically limited markets and paper-based documentation. Its core principles therefore remain documentary substantiation, periodic control, regulatory measurement rules and a predominantly retrospective analytical orientation.

Under Ukrainian Accounting Standard 10, credit risk is assessed either by individual analysis of specific debtors or by applying a doubtful-debt coefficient derived from historical data [5]. The same logic underlies most internal-control practices, which continue to rely on inventory results, reconciliation statements and ageing analyses of overdue amounts. This approach is consistent with the prudence principle. Yet it has clear limitations in a highly volatile environment: risk assessments are made largely after indicators of problematic receivables have already appeared. Accounting thus tends to document realised losses rather than to prevent them.

The acceleration of business processes intensifies the problem. Large enterprises process thousands of counterparty transactions daily and operate through electronic document management, digital payment systems, automated warehouses, CRM platforms and integrated ERP systems. Under these conditions selective, periodic control loses effectiveness because it cannot detect changes in the payment behaviour of individual debtors in a timely manner [9, p. 92–97; 10].

The nature of credit risk itself has also changed. Non-recovery is no longer driven primarily by the financial difficulties of individual counterparties. Macroeconomic instability, war-related risks, cyber threats, supply-chain disruptions, exchange-rate volatility and behavioural factors now play a larger role. A substantial share of these factors lies outside the scope of conventional accounting systems [4, p. 80–88].

A fundamental methodological contradiction therefore arises. Accounting measures assets on the basis of already substantiated events and transactions, in accordance with the principles of reliable representation and

prudence. Contemporary risk-oriented management, by contrast, requires timely information about probable future events. Even the expected-credit-loss model introduced by IFRS 9, while incorporating forward-looking information for financial-reporting purposes, remains oriented primarily towards the faithful presentation of the financial statements rather than towards continuous operational credit-risk control [6; 7, p. 3–4].

The result is the coexistence of two parallel information environments: the regulatory accounting system and autonomous management-analytics systems. This fragmentation produces duplication of functions, conflicting risk assessments, longer decision cycles and reduced managerial responsiveness. Integration of accounting, internal control and digital analytical tools is therefore becoming a central direction in the development of contemporary accounting methodology.

2. Empirical Analysis of ATIF LLC

To provide empirical support for the theoretical argument, the financial position and receivables management practices of ATIF LLC were examined. ATIF LLC is a Ukrainian wholesale trader in metals and metal ores (NACE 46.72; registration number 37070162). The analysis covers the period 2021–2025 and draws on the enterprise's financial statements, source documents, subsidiary ledgers, internal management reports, and questionnaires completed by 15 employees from the accounting, finance and sales functions.

Financial position and the role of trade receivables. The enterprise maintained modest but stable profitability. Net profit margins ranged between 0.34 % and 1.19 %. Total assets grew 3.1-fold over the five years. Current assets consistently accounted for 97–98 % of total assets.

Trade receivables formed the dominant and most risk-sensitive element of current assets. Their carrying amount rose from UAH 928.7 thousand in 2021 to a peak of UAH 6,373.2 thousand in 2024 (a 6.86-fold increase), before falling by 59.1 % to UAH 2,604.1 thousand in 2025. As a share of current assets, receivables stood at 84.8–88.8 % during 2022–2024 and declined to 52.0 % only in 2025. This pattern indicates a high degree of capital immobilisation in customer settlements.

Receivables turnover deteriorated sharply. The collection period lengthened from approximately 10 days in 2021 to 82 days in 2025 –

an 8.2-fold increase. The slowdown tied up substantial working capital and weakened liquidity.

In 2025 the current ratio stood at 2.01 and the quick ratio at 1.05. Both met conventional benchmarks. However, the still-elevated share of receivables (52 %) and the prolonged collection period reduced the quality of those liquidity ratios. During 2022–2024 the financial-risk ratio rose from 2.91 to 9.12, while the equity ratio fell to 0.10 in 2024.

Overall, the data show rapid growth in the scale of operations accompanied by a persistent and severe deterioration in receivables management.

The tension between accounting conservatism (anchored in the prudence principle) and managerial proactivity (driven by the need for timely risk foresight) is clearly visible in ATIF LLC's practices. The principal manifestations are summarised in Table 1 and elaborated below.

Table 1

Manifestations of the contradiction in the measurement and assessment of trade receivables at ATIF LLC

Manifestation	Accounting approach (conservatism)	Managerial requirement (proactivity)	Observable consequence at ATIF LLC
Temporal orientation	Retrospective, based on historical data	Forward-looking risk assessment	Collection period lengthened from 10 to 82 days
Basis for allowance	Historical default rates or ageing	Expected credit losses incorporating forecasts	Peak receivables of UAH 6,373.2 thousand in 2024
Frequency of information	Discrete (reporting dates)	Continuous monitoring	Continued extension of credit during 2022–2024 without early-warning signals
Effect on decision-relevant metrics	Prudent understatement of net receivables	Realistic appraisal of liquidity and risk	Quick ratio of 1.05 masks weaker effective liquidity

Source: compiled by the author from enterprise data.

Manifestation 1 – Retrospective allowance recognition. Under Ukrainian Accounting Standard 10 the allowance for doubtful debts is determined from historical non-payment experience or individual ageing analysis [5].

At ATIF LLC the allowance is formed largely after receivables have already become overdue. The sharp lengthening of the collection period suggests that actual credit risk exceeded the historically based provision, particularly in 2024 when receivables reached their peak. The resulting net receivables figure therefore understated the risk exposure relevant to operational decisions.

Manifestation 2 – Information lag. Accounting captures receivables primarily at reporting dates. Management, by contrast, requires continuous visibility of changing payment behaviour. In the absence of daily monitoring or behavioural early-warning indicators, the enterprise continued to grant payment deferrals throughout 2022–2024. The subsequent peak in receivables and the forced reduction in 2025 illustrate the cost of this lag.

Manifestation 3 – Distortion of liquidity indicators. Conservative measurement produces a lower net receivables balance, which can improve reported liquidity ratios. In 2025 the current and quick ratios appeared satisfactory, yet the low quality of the underlying receivables reduced true liquidity. The divergence between the accounting numbers and the economic reality delayed corrective action on collections.

Manifestation 4 – Fragmented internal control. Financial accounting focuses on regulatory compliance and prudence. The sales function prioritises volume growth through credit extension. Without a shared risk-assessment framework, control procedures remain fragmented. This contributed to the rise in the receivables-to-assets ratio to 84.8 % in 2024 and to the overall deterioration in the enterprise's financial-risk profile.

The evidence from ATIF LLC confirms that the existing accounting and control system remains predominantly retrospective. It constrains timely managerial response, reduces the efficiency of working-capital use, and elevates the probability of financial loss. These empirical findings reinforce the need for an integrated approach that retains the reliability of formal accounting while incorporating continuous, forward-looking credit-risk monitoring.

3. Concept of Cognitive Risk-Oriented Control

Digital technologies are changing the role of accounting within the enterprise information system. Accounting is no longer confined to the accumulation of source documents. It is evolving into a platform that

integrates accounting, financial, operational, logistics and commercial data flows [1, p. 15–25; 2, p. 93–96].

In international practice the related concepts of continuous accounting, continuous monitoring and continuous auditing have gained prominence. These approaches shift control from periodic reviews to the ongoing analysis of transactions through automated analytics [10; 11]. Their primary focus, however, remains either the automation of accounting procedures or the strengthening of assurance. They address only partially the integration of accounting with the strategic management of credit risk.

Contemporary literature on continuous auditing (CA) and continuous monitoring (CM) has significantly influenced the evolution of digital assurance and control practices. Continuous auditing is generally understood as a process that enables auditors to provide assurance on a subject matter in near real time, or shortly after the occurrence of events, by means of automated analytical procedures applied to entire populations of transactions rather than samples. Continuous monitoring, by contrast, is typically performed by management itself and focuses on the ongoing evaluation of internal controls and operational processes. Although the two concepts are closely related, they differ in purpose and ownership: CA is primarily an assurance activity, while CM is a management control activity [10; 11].

The theoretical foundations of continuous auditing were largely established in the late 1990s and early 2000s by researchers associated with the Rutgers Accounting Research Centre. Seminal contributions emphasised the shift from periodic, sample-based auditing to automated, full-population testing enabled by enterprise resource planning systems and advanced data analytics. Subsequent work expanded the conceptual model to include a continuum of assurance frequencies ranging from traditional periodic audits to fully continuous assurance. More recent studies have incorporated artificial intelligence, machine learning and anomaly-detection techniques, demonstrating their potential to identify unusual patterns that conventional rule-based controls might overlook.

The literature highlights several important strengths of CA and CM approaches. First, they allow the examination of entire transaction populations rather than statistical samples, thereby increasing the likelihood of detecting both material misstatements and operational anomalies.

Second, the near real-time nature of the analysis shortens the detection-to-correction cycle and supports more timely managerial intervention. Third, automated analytics can reduce the cost of routine testing over time and free professional judgement for higher-value tasks. Empirical studies and pilot implementations have reported improvements in control effectiveness, reductions in the time required for period-end procedures, and earlier identification of fraud or error indicators.

Nevertheless, a critical reading of the literature reveals several persistent limitations and unresolved tensions. Many published studies remain predominantly conceptual or laboratory-based. Large-scale, longitudinal implementations in complex organisational settings are still relatively scarce, and the external validity of reported benefits is therefore limited. Data quality and systems integration continue to pose significant practical challenges. Incomplete, inconsistent or poorly structured data can generate high rates of false positives, undermining user confidence and creating alert fatigue. The "black-box" nature of certain machine-learning algorithms raises further concerns regarding explainability and auditability – issues that are particularly acute when assurance conclusions must be defended before regulators or external auditors.

Another critical gap concerns the organisational and human dimensions of continuous approaches. Successful implementation requires not only technological infrastructure but also changes in skills, processes and organisational culture. Auditors and accountants need new competencies in data analytics and model interpretation, while management must be prepared to act on continuous signals. Resistance to change, unclear accountability for responding to alerts, and the risk of over-reliance on automated outputs are frequently under-examined in the technical literature. Moreover, most CA and CM research remains oriented towards assurance and internal-control testing rather than towards the operational management of specific financial risks, such as credit risk embedded in trade receivables.

A further limitation is the relatively weak integration of continuous techniques with formal financial-reporting requirements. While CA and CM can generate valuable risk signals, they do not automatically translate those signals into accounting estimates that satisfy the prudence, reliability and auditability criteria of standards such as Ukrainian Accounting Standard 10 or IFRS 9. The literature tends to treat continuous analytics

and regulatory accounting as parallel rather than tightly coupled systems. This separation reproduces, at a technological level, the very information gap between accounting and risk management that the present study seeks to address.

In summary, research on continuous auditing and continuous monitoring has established an important conceptual and technological foundation for moving beyond periodic, retrospective control. At the same time, the field still faces material challenges related to data quality, model transparency, organisational readiness and the limited linkage with formal accounting measurement. The cognitive risk-oriented control model developed in this chapter builds upon the strengths of CA and CM – continuous data processing, full-population analysis and predictive capability – while deliberately embedding these capabilities within a two-layer architecture that preserves regulatory compliance and professional accountability. In doing so, it attempts to narrow the gap between continuous digital assurance techniques and the practical requirements of credit-risk management and financial reporting.

Against this background the present study proposes the concept of cognitive risk-oriented control of trade receivables. The concept treats accounting not as the final stage of transaction recording but as a core component of an intelligent decision-support system.

Cognitive capability is defined here as the capacity of an information system to:

– process large volumes of structured and unstructured data;

– identify patterns and anomalies that are not visible through conventional ageing analysis;

– generate probabilistic forecasts of default and recovery;

– produce transparent, auditable recommendations for credit-policy decisions while preserving the possibility of professional judgement.

In this framework accounting retains its regulatory function and continues to satisfy the requirements of Ukrainian Accounting Standard 10 and IFRS 9 [5; 6]. At the same time it is supplemented by forward-looking analytical tools operating within a single information environment.

The system draws on several interconnected data flows:

– internal accounting records, source documents and trial balances;

– management data on credit limits, settlement history and sales policy;

– behavioural data from CRM systems;

– operational data from ERP platforms (logistics, contract performance);

– external sources (state registers, court decisions, tax data, credit ratings and macroeconomic indicators).

Integration of these flows enables a shift from the assessment of existing receivables to the forecasting of their future quality.

The change in analytical logic is fundamental. Conventional accounting answers the question «What has already happened?». Cognitive risk-oriented control addresses a wider set of managerial questions:

– which counterparties currently exhibit the highest probability of default;

– how the risk profile of the receivables portfolio is likely to evolve in the near term;

– what impact expected macroeconomic changes may have on portfolio quality;

– how credit terms and limits should be adjusted to limit potential losses;

– which transactions display anomalous patterns that warrant investigation.

Accounting information therefore ceases to be the final output of the recording process and becomes the primary input for an intelligent decision-support system.

Contribution of the proposed concept. The concept contributes to the literature by systematically combining three elements that are usually treated separately:

the regulatory reliability and auditability required by accounting standards;

continuous digital monitoring of transactions and counterparty behaviour;

predictive analytics capable of generating forward-looking credit-risk signals.

By embedding these elements within a single architecture, the approach reduces the information gap between formal accounting and operational credit-risk management while preserving compliance with existing financial-reporting requirements.

4. Dynamic Accounting – Management Continuum

Digital transformation requires accounting to move beyond the accumulation of historical data. Accounting must become an integral part of a single enterprise management information environment that combines business analytics, risk management, machine learning and digital decision-support platforms [1, p. 15–25; 2, p. 93–96].

Most current models of digital transformation still treat accounting and management as separate functional blocks linked mainly by periodic information exchange. Information therefore passes through several processing stages and loses operational value before it reaches decision-makers. This separation reproduces the very contradictions observed at ATIF LLC: retrospective allowance recognition, information lag, distorted liquidity signals and fragmented internal control.

To overcome the separation, a dynamic accounting–management continuum is proposed. In this continuum accounting, internal control, risk management and digital analytics function as one adaptive system. Information flows continuously and in both directions. Analytical outputs directly shape accounting estimates and control procedures, while accounting data are continuously enriched by internal and external digital sources.

Core principles and their realisation. The continuum rests on five interrelated principles.

Continuity. Data on invoices, payments, credit-limit utilisation and customer behaviour are captured and processed in near real time. There is no need to wait for the end of a reporting period before risk signals become available. At ATIF LLC this would have allowed the lengthening collection period (from 10 to 82 days) to be detected months earlier than the annual or quarterly statements revealed it.

Integration. Accounting records, ERP operational data, CRM behavioural data and external sources (registers, court decisions, credit ratings) reside in a unified data environment. Reconciliation between financial and managerial figures becomes automatic rather than manual. The fragmentation between the accounting and sales functions observed at ATIF LLC is thereby reduced.

Adaptability. Credit-risk models are recalibrated automatically when new payment patterns or macroeconomic indicators appear. Historical

loss rates used for the allowance under Standard 10 are supplemented by updated probability-of-default estimates. The conservative, backwards-looking allowance that failed to reflect rising risk in 2022–2024 would be adjusted dynamically.

Predictive capability. Forward-looking models generate estimates of expected credit losses and early-warning indicators. Management receives probabilities of default and projected cash-collection profiles rather than only ageing schedules. This directly addresses the information lag that permitted continued credit extension at ATIF LLC until the 2024 peak.

Cognitive capability. The system accumulates experience from each new transaction cycle, improves pattern recognition and produces auditable recommendations. Professional judgement is retained: the accountant can accept, modify or override model outputs. The system therefore supports, rather than replaces, the regulatory requirements of Standard 10 and IFRS 9 [5; 6].

How the continuum resolves the contradictions identified in ATIF LLC is shown in Table 2.

By converting the linear sequence «transaction → accounting → statements → decision» into a continuous loop, the continuum reduces the temporal and organisational gaps that produced the problems documented at ATIF LLC.

Table 2

Resolution of the contradictions identified at ATIF LLC through the dynamic accounting–management continuum

Contradiction observed at ATIF LLC	Mechanism within the continuum	Expected effect
Retrospective allowance recognition	Continuous updating of probability-of-default estimates	Allowance reflects current and forward-looking risk
Information lag (discrete reporting)	Real-time monitoring of payment behaviour and limit utilisation	Earlier detection of deteriorating receivables
Distorted liquidity indicators	Parallel calculation of regulatory and risk-adjusted net receivables	More realistic appraisal of effective liquidity
Fragmented internal control	Shared risk scores visible to accounting, finance and sales	Aligned objectives and coordinated credit decisions

Source: compiled by the author

The dynamic accounting–management continuum therefore supplies the methodological foundation for the two-layer risk-oriented control system presented in the following section. It preserves the reliability and auditability of formal accounting while embedding the forward-looking and adaptive capabilities required for effective credit-risk management.

5. Two-Layer Model of Cognitive Control

Building on the dynamic accounting–management continuum, a two-layer model of cognitive risk-oriented control is proposed. The model keeps the regulatory integrity of financial accounting while adding continuous digital analytics and forward-looking risk management [5; 6].

A central design feature is the clear separation of functions combined with continuous information integration. The conservative accounting layer produces auditable, standards-compliant figures. The cognitive analytical layer generates predictive signals and recommendations. The two layers exchange data in real time but remain distinct in purpose and accountability.

First layer – the conservative accounting layer. This layer ensures full compliance with Ukrainian Accounting Standard 10 and IFRS 9. Its core functions are:

– documentary substantiation of transactions;
– recognition and classification of trade receivables;
– measurement at net realisable value;
– calculation of the allowance for doubtful debts (or expected credit losses);
– preparation of financial-statement disclosures;
– maintenance of data reliability and auditability.

The layer performs the traditional role of producing legally substantiated financial information. It does not itself forecast future credit losses or generate operational recommendations.

Second layer – the cognitive analytical layer. This layer operates in parallel as an intelligent decision-support system. Its purpose is to identify rising credit risk before receivables become overdue. It draws on a wider information set than formal accounting:

– accounting records and trial balances;
– ERP operational data;
– CRM behavioural data;

– settlement history and payment patterns;
– counterparties' financial statements;
– state registers, court decisions and tax data;
– credit ratings and macroeconomic indicators.

The proposed model comprises five interconnected functional blocks.

Data integration block. Data are extracted automatically from accounting software, ERP, CRM, banking interfaces and external registers. Standard cleansing, validation and reconciliation routines are applied so that both layers work from a consistent data foundation.

Cognitive analytics block. Machine-learning models process the integrated data to estimate:

– probability of default (PD);
– likelihood and expected timing of overdue payment;
– behavioural risk scores;
– expected credit loss (ECL) amounts;
– indicators of anomalous or potentially fraudulent activity.

Models are retrained periodically as new outcomes become available, allowing adaptation to changing economic conditions [10; 11].

Risk assessment block. Outputs from the analytics block are converted into an operational credit profile for each counterparty. The profile includes risk category, recommended credit limit, suggested payment terms, expected collection period and a forward-looking loss allowance. Risk assessment therefore becomes continuous rather than periodic.

Managerial decision-support block. The system produces concrete, auditable recommendations, for example:

– adjustment of credit limits;
– shortening of payment terms;
– requirement of partial prepayment;
– intensification of collection activity;
– transfer to factoring.

Final decisions remain with designated managers; the system supplies evidence and ranked options rather than autonomous actions.

Self-adaptation block. After each completed collection cycle the system compares earlier forecasts with actual outcomes. Model parameters are updated automatically. This continuous learning loop is what gives the layer its cognitive character while still leaving professional judgement intact.

Interaction between the two layers. Predictive signals from the cognitive layer do not override accounting entries. Instead they trigger review procedures within the conservative layer. When the analytical layer indicates a material change in risk, the accountant reassesses the allowance under Standard 10 or IFRS 9, documents the rationale, and records any adjustment. In this way forward-looking information informs accounting estimates without compromising the prudence principle or auditability. The way the two-layer model addresses the specific contradictions identified at ATIF LLC is summarised in Table 3.

Table 3

Resolution of the contradictions identified at ATIF LLC through the two-layer model of cognitive risk-oriented control

Contradiction at ATIF LLC	Mechanism in the two-layer model	Expected improvement
Retrospective allowance recognition	Cognitive layer supplies updated PD and ECL estimates for review	Allowance reflects current and forward-looking risk
Information lag	Continuous monitoring of payment behaviour and limit utilisation	Earlier detection of deteriorating receivables
Distorted liquidity indicators	Parallel production of regulatory and risk-adjusted figures	More realistic view of effective liquidity
Fragmented internal control	Shared risk profiles visible to accounting, finance and sales	Coordinated credit decisions and aligned objectives

Source: compiled by the author

Unlike conventional credit-scoring or pure machine-learning applications, the two-layer model does not replace accounting. It extends accounting's functional scope by embedding predictive capability inside a structure that preserves regulatory reliability and professional accountability. The result is a coherent system in which formal financial information and operational risk intelligence reinforce rather than contradict each other.

6. Practical Validation of the Model

To test the practical applicability of the proposed concept, a six-month pilot of the cognitive risk-oriented control model was conducted

at ATIF LLC (October 2025 – March 2026). The enterprise is characterised by a high share of trade credit, concentrated receivables and elevated non-payment risk. These features make it a suitable case for evaluating the model.

During the pilot a two-layer system operated. The conservative accounting layer continued to maintain records in full compliance with Ukrainian Accounting Standard 10, IFRS 9 and the Tax Code of Ukraine [5; 6; 12]. Recognition, measurement and presentation procedures remained unchanged, preserving the regulatory reliability of the financial information.

The cognitive layer was connected to the existing ERP system through an API. Data from account 36 «Settlements with customers» were transferred daily, cleansed and standardised. The analytical module estimated the probability of payment delay, produced an integrated credit-risk rating for each counterparty and generated recommendations for credit-policy adjustments. Final decisions stayed with the enterprise's managers.

The pilot therefore examined both forecasting performance and the feasibility of integrating the cognitive module without breaching accounting standards. The results of the two-layer system are presented in Table 4.

Table 4

Comparison of trade-receivables indicators before and after the pilot implementation

Indicator	Before implementation	After implementation	Absolute change
Trade receivables, UAH thousand	2,604.1	2,604.1	–
Allowance for doubtful debts, UAH thousand	487 (18.7 %)	312 (12.0 %)	–175
Net trade receivables, UAH thousand	2,117	2,292	+175
Average overdue period, days	82	52	–30
Share of overdue receivables, %	28.0	17.5	–10.5 p.p.
Receivables turnover period, days	82	51	–31
Accuracy of non-payment forecasts, %	–	84.2	–

Source: calculated by the author from enterprise data and pilot results.

The overall volume of trade receivables remained stable. Their qualitative composition, however, improved. The allowance fell from UAH 487 thousand (18.7 %) to UAH 312 thousand (12.0 %). The reduction is interpreted as the result of earlier identification of higher-risk counterparties and more timely adjustments to credit terms, rather than a relaxation of prudence.

Net receivables increased by UAH 175 thousand, reflecting both the lower allowance and greater predictability of cash inflows.

Operational metrics showed clearer gains. The average overdue period shortened from 82 to 52 days and the turnover period from 82 to 51 days. The share of overdue receivables declined by 10.5 percentage points. These movements suggest that the system enabled faster managerial responses once early-warning signals appeared.

Forecast accuracy reached 84.2 %. Accuracy was measured as the proportion of counterparties for which the model correctly predicted a payment delay of more than 30 days within a 90-day horizon, using an out-of-time validation sample. While this figure indicates useful predictive power, it should be read with caution given the relatively short pilot window and the single-enterprise setting.

There are some limitations. The pilot covered only six months and one wholesale-trading firm. External factors (changes in customer mix, market conditions or collection effort) may have contributed to the observed improvements. No formal control group was established. Consequently the results demonstrate practical feasibility and directional benefits rather than definitive causal proof.

Within the limits of the pilot, the two-layer model proved compatible with existing accounting procedures and produced measurable improvements in the quality and turnover of trade receivables. The findings support the view that cognitive risk-oriented control can shift receivables management from a predominantly reactive stance toward a more proactive one, while still satisfying regulatory requirements.

The successful introduction of the two-layer cognitive risk-oriented control model in a medium-sized enterprise requires a structured, staged approach. The following sequence has been derived from the pilot experience at ATIF LLC and from the broader requirements of integrating predictive analytics with formal accounting systems.

1. Preparatory stage. Top management defines the strategic objectives of the project (for example, reduction of overdue receivables or improvement of working-capital turnover). A cross-functional working group is formed, typically including representatives of accounting, finance, sales and information technology. The current credit policy, existing data sources and key risk indicators are reviewed. Clear success metrics and a realistic timeline are established.

2. Data integration. Accounting records (especially the customers' settlements account), ERP operational data, CRM behavioural data and selected external sources are mapped and connected through secure interfaces or an API. Data-cleansing and validation rules are defined so that both the conservative accounting layer and the cognitive analytical layer operate on a consistent information base. Particular attention is paid to data completeness, accuracy and timeliness.

3. Staff training. Accountants, credit controllers and sales managers receive targeted training. The programme covers the logic of the two-layer model, the interpretation of risk scores and recommendations, and the continued importance of professional judgement. Emphasis is placed on the fact that the system supports, rather than replaces, human decision-making. Short practical workshops using the enterprise's own data prove especially effective.

4. Pilot implementation. The model is first applied to a limited portfolio of counterparties or to one business unit for a defined period (commonly three to six months). During the pilot the conservative accounting layer continues to function in full compliance with regulatory requirements, while the cognitive layer generates signals and recommendations. Results are monitored weekly, model parameters are adjusted, and user feedback is collected systematically.

5. Scaling and continuous improvement. After a successful pilot the system is extended to the full receivables portfolio. Credit-policy rules are updated to incorporate the new risk signals. Ongoing model performance is reviewed at regular intervals, and the self-adaptation mechanisms are allowed to refine forecasts on the basis of actual outcomes. Periodic post-implementation reviews ensure that the model remains aligned with changing business conditions and regulatory expectations.

When these stages are followed in sequence, the organisation can introduce cognitive risk-oriented control with manageable risk, preserve the integrity of financial reporting, and gradually embed predictive analytics into everyday credit-management practice.

7. Economic Assessment of Implementation

A structured economic assessment of the six-month pilot was performed. The main quantitative results are summarised in Table 5.

Two distinct effects must be separated. The first is an accounting effect. The reduction in the allowance by UAH 175 thousand increased reported profit. This figure improves the financial statements but does not automatically generate an equivalent cash inflow in the same period.

Table 5

Economic assessment of the two-layer system at ATIF LLC (six-month pilot)

Indicator, UAH thousand	Before implementation	After implementation	Absolute change
Allowance for doubtful debts	487	312	–175
Accounting effect (increase in reported profit)	–	+175	+175
Estimated additional cash flow from faster turnover	–	+680	+680
Implementation costs (development and integration)	–	185	–
Indicative six-month operating costs	–	45	–
Net cash effect (cash flow – total costs)	–	+450	–

Source: calculated by the author from enterprise data and pilot results.

The second is a cash-flow effect. Faster collection of receivables released working capital. The additional cash flow of approximately UAH 680 thousand was estimated from the observed reduction in the turnover period (from 82 to 51 days) applied to the average daily sales on credit during the pilot. The calculation is necessarily approximate because daily sales volumes fluctuated and no formal control group existed.

Implementation costs totalled UAH 185 thousand. Indicative operating costs for the six-month period (model maintenance, data updates and limited staff time) were estimated at UAH 45 thousand. After deducting both categories of cost, the net cash effect for the pilot period stands at roughly UAH 450 thousand.

On the basis of the pilot figures the following indicators were calculated:

Simple ROI for the six-month period: approximately 243 % (net cash effect divided by total costs).

Payback period: approximately 2.1 months.

Indicative NPV over a three-year horizon: UAH 3.1 million (discount rate 18 %, assumption of gradually declining incremental cash flows, and inclusion of ongoing annual operating costs of UAH 90 thousand).

These figures are sensitive to the assumptions used. In particular, the cash-flow benefit may not remain constant, and operating costs could prove higher once the system is fully embedded.

There are some limitations. The assessment rests on a single six-month pilot in one wholesale enterprise. External factors may have contributed to the observed improvement in turnover. The separation of the pure model effect from other influences remains imperfect. Consequently the results demonstrate economic feasibility and a favourable direction of change rather than a precise, generalisable return.

Within the limits of the available data, the pilot generated a positive net cash effect and attractive short-term investment metrics. The economic benefit arises mainly from improved working-capital utilisation, supported by a secondary accounting gain from a lower allowance. Longer-term value will depend on the stability of the cash-flow improvement and on the actual cost of maintaining the cognitive layer.

8. Scenario Modelling of Model Resilience

Scenario modelling was used to test the robustness of the economic results. Three scenarios were constructed for a three-year horizon: optimistic, baseline and pessimistic. The key assumptions underlying each scenario are set out below (Table 6).

Table 6

Scenario results over a three-year period at ATIF LLC (UAH thousand)

Scenario	Cumulative net cash effect	Approximate ROI over three years	NPV at 18 %	Indicative payback (months)
Optimistic	4,850	1,180 %	3,720	1.8
Baseline	3,150	760 %	2,410	2.4
Pessimistic	1,680	390 %	1,050	3.9

Source: calculated by the author on the basis of pilot results and the stated assumptions.

Baseline scenario. Incremental cash flows remain close to the levels observed in the pilot, declining modestly after the first year as the most obvious collection gains are realised. Annual operating costs stay at approximately UAH 90 thousand. The discount rate is set at 18 %.

Optimistic scenario. The improvement in receivables turnover is sustained and slightly extended through wider use of the model's recommendations. Operating costs rise only marginally. The same 18 % discount rate is applied.

Pessimistic scenario. The cash-flow benefit halves after the first year because of weaker customer compliance or less consistent managerial follow-up. Operating costs increase to UAH 120 thousand per year. The discount rate remains 18 %.

Under all three scenarios the net present value remains positive. Even in the pessimistic case the project recovers its costs and generates a modest surplus. This suggests that the model retains economic viability across a reasonable range of operating conditions.

The optimistic scenario indicates scope for a larger effect if the enterprise applies the system's recommendations more consistently. The pessimistic scenario shows that the results are sensitive to the durability of the cash-flow improvement and to operating costs.

There are some limitations. The scenarios rest on simplified assumptions and on data from a single six-month pilot. They do not capture every possible external shock. The figures should therefore be read as indicative of directional resilience rather than as precise forecasts.

Overall, the scenario analysis supports the conclusion that the two-layer model can remain economically positive under both favourable and adverse conditions, provided that the core improvement in working-capital turnover is at least partially sustained.

9. Discussion of Research Results

The results indicate that the proposed cognitive model of risk-oriented control does not contradict existing accounting principles. It extends their functional scope under the digital transformation of the economy. Traditional accounting primarily records the consequences of realised credit risk. The proposed model supports earlier identification of risk and supplies an information basis for preventive management.

The findings align with broader trends in digital accounting. They differ from prior approaches by integrating financial reporting requirements with cognitive analytics tools inside a single information environment. The model represents one promising direction for the further development of accounting methodology amid the wider adoption of artificial intelligence, machine learning and digital enterprise management platforms.

The comparative analysis in Table 7 traces the evolution of approaches to the accounting for and control of trade receivables. It moves from a retrospective model focused on completed transactions, through the forward-looking concept of IFRS 9 that incorporates expected credit losses, to the proposed cognitive risk-oriented model. The latter integrates accounting records, digital analytics, artificial intelligence techniques and decision-support functions within a unified information environment.

Unlike purely traditional models, the proposed approach enables continuous monitoring of trade receivables, adaptive forecasting of credit risk and the generation of managerial recommendations. It does not replace existing accounting standards. Instead, it extends their practical reach by combining the regulatory reliability of financial information with contemporary digital analytics tools. Human oversight remains essential: the system supplies ranked recommendations and early signals, while final decisions on credit policy, limits and recovery actions rest with managers.

Table 7

Comparative Characteristics of the Traditional Approach, the IFRS 9 Model and the Cognitive Risk-Oriented Model of Trade Receivables Management

Comparison criterion	Traditional accounting approach (UAS 10)	IFRS 9 Model (Expected Credit Loss)	Proposed cognitive risk-oriented model
Primary objective	Faithful representation of trade receivables in the financial statements	Measurement of expected credit losses to ensure faithful representation in the financial statements	Proactive trade receivables management and reduction of credit risk supported by predictive analytics
Object of analysis	Existing trade receivables	Financial assets subject to measurement under the expected credit loss model	Full life cycle of interaction with the counterparty: from contract conclusion to settlement of the receivable
Nature of risk assessment	Retrospective	Forward-looking, but governed by regulatory requirements	Continuous, adaptive, forward-looking and risk-oriented
Time horizon of assessment	Past events	Future credit losses over the life of the asset	Current position together with short-, medium- and long-term forecasts of debtor behaviour
Assessment methods	Receivables ageing analysis, doubtful debt coefficients, accountant's professional judgement	Expected Credit Loss (ECL) model (PD, LGD, EAD), scenario analysis	Machine learning, predictive analytics, scoring models, behavioural analysis, clustering, anomaly detection, scenario modelling
Frequency of control	Periodic (at the reporting date or during inventory-taking)	Regular, in accordance with the requirements of the standard	Continuous monitoring with near real-time capability
Support for managerial decision-making	Limited; used after completion of the accounting cycle	Partial; supports credit risk assessment and the recognition of loss allowances	Extensive; the system generates recommendations on credit limits, settlement terms, factoring, claims management and risk actions. Final decisions remain with managers
Response to changes in risk	After the occurrence of a negative event	Following risk reassessment in accordance with the requirements of the standard	Before adverse consequences materialise, through forecasting of default probability

Source: Compiled by the author

Several limitations must be acknowledged. The effectiveness of the model depends heavily on the quality, completeness and timeliness of input data. Incomplete or biased historical records reduce the reliability of predictive outputs. The explainability of certain machine-learning components remains limited, which may hinder auditability and regulatory acceptance. Organisational resistance to changes in established credit and accounting processes can slow adoption. The pilot results, while encouraging, derive from a specific organisational context and sample; broader generalisation requires further testing across industries, firm sizes and economic conditions.

Future research should examine the model's performance under varying data-quality regimes, develop more transparent hybrid analytical architectures, and assess long-term effects on working-capital metrics and credit-policy outcomes.

Comparative multi-enterprise studies and longitudinal evaluations would strengthen the evidence base and clarify the conditions under which cognitive risk-oriented control delivers sustained benefits.

CONCLUSIONS

The study has examined the methodological foundations of accounting for and control of trade receivables in the context of digital transformation. It has shown that traditional approaches, grounded in Ukrainian Accounting Standard 10, remain largely retrospective. They record the consequences of credit risk after it has materialised and therefore provide limited support for timely managerial action. IFRS 9 introduces a forward-looking expected-credit-loss framework, yet its primary purpose is still the faithful representation of information in the financial statements rather than continuous operational risk management.

Empirical evidence from ATIF LLC confirmed the practical consequences of this gap. Rapid growth in trade receivables was accompanied by a sharp deterioration in collection periods, elevated capital immobilisation and fragmented control between accounting and commercial functions. Liquidity ratios appeared satisfactory while the underlying quality of receivables declined, illustrating the divergence between regulatory measurement and economic reality.

In response, the concept of cognitive risk-oriented control has been developed. The concept integrates the reliability and auditability requirements of formal accounting standards with continuous monitoring, predictive analytics and decision-support tools. Accounting data are treated not solely as the basis for retrospective reporting but as a continuously updated substrate for forward-looking credit-risk assessment.

The dynamic accounting–management continuum supplies the methodological architecture for this integration. Continuity, integration, adaptability, predictive capability and cognitive learning operate as interrelated principles that convert the linear sequence of transaction, recording and reporting into a continuous feedback loop. Building on this continuum, a two-layer model has been proposed. The conservative accounting layer maintains full compliance with existing standards. The cognitive analytical layer generates early-warning signals, probability-of-default estimates and ranked recommendations while leaving final decisions with managers.

A six-month pilot implementation at ATIF LLC demonstrated practical feasibility. The overall volume of receivables remained stable, yet qualitative and operational indicators improved: the allowance for doubtful debts declined, the average overdue period shortened by thirty days, the share of overdue receivables fell by 10.5 percentage points and forecast accuracy reached 84.2 per cent. Economic assessment indicated a positive net cash effect arising primarily from faster working-capital turnover, with attractive short-term investment metrics. Scenario modelling over a three-year horizon confirmed that the net present value remained positive under optimistic, baseline and pessimistic assumptions.

The proposed approach does not replace existing accounting standards. It extends their functional scope by embedding predictive capability within a structure that preserves regulatory reliability and professional accountability. Human oversight remains essential.

Several limitations must be noted. Model performance depends on the quality and completeness of input data. The explainability of certain machine-learning components is still limited. Organisational resistance may slow adoption. The pilot results derive from a single enterprise and a relatively short observation window; broader generalisation requires further testing.

Future research should examine the model under varying data-quality regimes, develop more transparent hybrid architectures, and evaluate long-term effects on working-capital metrics across different industries and firm sizes. Comparative multi-enterprise studies and longitudinal assessments would strengthen the evidence base and clarify the conditions under which cognitive risk-oriented control delivers sustained benefits.

Overall, the findings support the view that the systematic integration of formal accounting with continuous digital analytics constitutes a viable and economically promising direction for the further development of accounting methodology under conditions of digital transformation.

References:

1. Thanasas, G., Kampiotis, G. & Halkiopoulos, C. (2026) Transforming Digital Accounting: Big Data, IoT, and Industry 4.0 Technologies – A Comprehensive Survey. *Journal of Risk and Financial Management*, vol. 19, no. 1, p. 92. DOI: https://doi.org/10.3390/jrfm19010092

2. Rise2040 Project (2023). *The Future of the Accounting Profession: Global Report 2023*. London: ACCA & Chartered Global Management Accountant, 84 p. Available at: https://rise2040.com/vision-report

3. Vitrenko, O., Katranzhy, L. & Prydatko, E. (2020) Orhanizatsiia obliku debitorskoi zaborhovanosti v systemi upravlinnia ryzykamy [Organisation of accounts receivable accounting in the risk management system]. *Naukovyi visnyk Uzhhorodskoho natsionalnoho universytetu. Seriia: Mizhnarodni ekonomichni vidnosyny ta svitove hospodarstvo – Uzhhorod National University Herald. Series: International Economic Relations and World Economy*, vol. 34, pp. 35–42. DOI: https://doi.org/10.32782/2413-9971/2020-34-6

4. Brazilii, N. & Bilan, Yu. (2025) Vplyv tsyfrovoi transformatsii bukhhalterskoho obliku na pidkhody do otsinky ta upravlinnia debitorskoiu zaborhovanistiu v umovakh nestabilnoho rynku [The impact of digital transformation of accounting on approaches to assessing and managing accounts receivable in an unstable market]. *Visnyk Cherkaskoho derzhavnoho tekhnolohichnoho universytetu – Bulletin of Cherkasy State Technological University*, vol. 26, no. 4, pp. 75–90. DOI: https://doi.org/10.24025/2306-4420.77(4).2025.342909 (in Ukrainian).

5. Ministry of Finance of Ukraine (1999) Polozhennia (standart) bukhhalterskoho obliku 10 «Debitorska zaborhovanist» [Regulation (Standard) of Accounting 10 «Accounts Receivable»]: zatverdzheno nakazom Ministerstva finansiv Ukrainy vid 08.10.1999 № 237. Available at: https://zakon.rada.gov.ua/laws/show/z0725-99#Text (in Ukrainian).

6. International Accounting Standards Board. (2014). *IFRS 9 financial instruments*. IFRS Foundation. Available at: https://www.ifrs.org/issued-standards/list-of-standards/ifrs-9-financial-instruments/

7. Hutsalenko, L. & Melnyk, A. (2020) Oblik debitorskoi zaborhovanosti: kontseptualni osnovy P(S)BO ta MSFZ [Accounting for receivables: conceptual foundations of national accounting standards and IFRS]. *Efektyvna ekonomika – Efficient Economy*, no. 9. Available at: http://www.economy.nayka.com.ua/?op=1&z=8173 (in Ukrainian)

8. Shepel, T. & Vintoniak, A. (2023) Orhanizatsiino-metodychni aspekty obliku debitorskoi zaborhovanosti: vitchyznianyi ta zarubizhnyi dosvid [Organizational and methodological aspects of receivables accounting: domestic and foreign experience]. *Ekonomika ta suspilstvo – Economy and Society*, no. 52. DOI: https://doi.org/10.32782/2524-0072/2023-52-56

9. Demchenko, T. (2025) Oblikovo-analitychne zabezpechennia upravlinnia debitorskoiu zaborhovanistiu pidpryiemstv v umovakh avtomatyzatsii [Accounting and analytical support for trade receivables management of enterprises under conditions of automation]. *Ekonomichni horyzonty – Economies' Horizons*, vol. 2(31), pp. 92–99. DOI: https://doi.org/10.31499/2616-5236.2(31).2025.330127 (in Ukrainian).

10. Cai, T. (2024). Continuous auditing and risk monitoring: Implementation with credit line management. *ISACA Journal*, no. 5. Available at: https://www.isaca.org/resources/isaca-journal/issues/2024/volume-5/continuous-auditing-and-risk-monitoring

11. Hemati, H., Schreyer, M., & Borth, D. (2021). Continual learning for unsupervised anomaly detection in continuous auditing of financial accounting data. Available at: https://arxiv.org/abs/2112.13215

12. State Tax Service of Ukraine (2026) Analitychna platforma «Big Data TP» [Big Data TP Analytical Platform]. Ofitsiinyi sait. Available at: https://tax.gov.ua/big-data (in Ukrainian).