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Improving The System for Digital Identification and Monitoring of Financial Risks At Industrial Enterprises

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Abstract: This study examines approaches to improving the digital identification and monitoring of financial risks at industrial enterprises. The relevance of the research is determined by increasing financial uncertainty, exchange-rate volatility, changing borrowing costs, liquidity constraints, and fluctuations in production and market conditions. The study develops a conceptual framework that integrates financial indicators, digital data processing, risk scoring, early-warning signals, and continuous monitoring mechanisms. The proposed approach combines traditional financial analysis with digital technologies to improve the timeliness and accuracy of risk identification. Particular attention is paid to liquidity, credit, profitability, market, currency, and operational risks. The results indicate that a digital monitoring system can strengthen early detection of financial threats and support more timely managerial decision-making. The study proposes several directions for improving risk-monitoring infrastructure, including automated data collection, integrated analytical dashboards, predictive models, and risk thresholds.

Keywords: financial risk, digital monitoring, industrial enterprises, risk identification, financial stability, early warning system, digital technologies, risk management.

Citation: Mazhit kizi, Z. S. Improving The System for Digital Identification and Monitoring of Financial Risks At Industrial Enterprises. American Journal of Economics and Business Management 2026, 9(9), 1094-1100

Received: 13th Jun 2026

Revised: 28th Jul 2026

Accepted: 15th Aug 2026

Published: 28th Sep 2026



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1. Introduction

Industrial enterprises operate in an increasingly uncertain financial environment characterized by fluctuations in production costs, exchange rates, interest rates, demand, supply-chain conditions, and access to financial resources. These factors can significantly affect liquidity, profitability, solvency, and the overall financial stability of enterprises. Under such conditions, traditional approaches based mainly on periodic financial reporting may not provide sufficiently rapid identification of emerging financial risks.

Digital transformation creates new opportunities for improving financial risk management. Modern enterprises can integrate accounting data, financial statements, production indicators, sales information, cash-flow data, market information, and other operational indicators into a unified analytical environment. This makes it possible to monitor financial risks continuously rather than only at the end of a reporting period.

The development of digital monitoring systems is particularly important for industrial enterprises because their financial performance is closely connected with production cycles, inventory levels, accounts receivable, capital intensity, energy costs, foreign-currency transactions, and investment requirements. Consequently, a delay in identifying a financial threat can result in liquidity shortages, deterioration of profitability, increasing debt obligations, or reduced investment capacity.

The objective of this study is to develop recommendations for improving the system of digital identification and monitoring of financial risks at industrial enterprises.

The main research tasks are to:

- a. Identify the major financial risks affecting industrial enterprises;
- b. Examine the role of digital technologies in financial-risk monitoring;
- c. Develop a structured system of digital risk indicators;
- d. Determine directions for improving early identification of financial threats;
- e. Propose an integrated digital monitoring framework for managerial decision-making.

The scientific novelty of the study lies in combining financial-risk indicators with digital monitoring instruments into an integrated early-warning framework that enables enterprises to move from periodic assessment toward continuous risk identification.

1.1 Literature Review

Financial risk management is a central component of corporate financial management because liquidity, leverage, profitability, cash flow, and investment decisions jointly determine an enterprise's capacity to absorb uncertainty. Brigham and Ehrhardt emphasize the interaction between financing decisions, risk, and firm value [1]. Ross, Westerfield, and Jordan likewise show that liquidity and capital-structure indicators are fundamental to evaluating corporate financial condition [2]. Damodaran further explains that risk assessment should connect operating performance, financing exposure, and valuation rather than treat individual ratios in isolation [3].

The enterprise-risk-management perspective extends this financial view by integrating risk identification with strategy and organizational performance. The COSO Enterprise Risk Management framework stresses that risk management should be embedded in strategy setting and performance management [4]. Empirical evidence also indicates that more mature enterprise-risk-management processes can be associated with stronger operating performance, reinforcing the value of integrated rather than fragmented risk assessment [5].

Digital transformation changes the speed, scope, and granularity of financial-risk analysis. The OECD Digital Economy Outlook 2024 documents the expanding role of data, artificial intelligence, digital infrastructure, and advanced analytical technologies in economic activity [6]. In the financial sector, the Basel Committee has also highlighted both the opportunities and the supervisory and operational implications created by financial technology, emphasizing governance, data, and risk-control considerations [7]. For industrial enterprises, these developments support the integration of accounting, production, sales, inventory, cash-flow, and market information into a continuous monitoring environment.

The foundations of financial-distress prediction demonstrate why early-warning indicators are important. Beaver's univariate analysis showed that accounting ratios can provide signals of corporate failure before bankruptcy occurs [8]. Altman's multiple-discriminant model subsequently demonstrated the value of combining several financial ratios into a structured distress-prediction score [9]. Ohlson introduced a probabilistic approach using financial ratios and firm characteristics to estimate bankruptcy risk [10], while Zmijewski developed an alternative probit-based distress model and drew attention to methodological issues related to sample selection [11]. These studies established the analytical basis for moving from isolated indicators toward integrated risk-scoring systems.

More recent research has extended distress prediction through machine learning and artificial intelligence. Shi and Li's systematic review found that logistic regression and neural networks remain prominent approaches while newer machine-learning methods have increasingly entered corporate bankruptcy prediction [12]. Zhao, Ouenniche, and De Smedt provide a more recent survey showing substantial methodological diversification in bankruptcy and financial-distress prediction, including advances in preprocessing, feature selection, classification, and model evaluation [13]. Nugroho's systematic review further reports growing use of hybrid statistical and artificial-intelligence models and

emphasizes the importance of multi-year data and both financial and nonfinancial determinants [14].

Digital monitoring should therefore be understood as an evolution of conventional financial analysis rather than a replacement for it. The World Economic Forum's global-risk work underscores the increasingly interconnected nature of economic, technological, and operational risks, which strengthens the case for integrated monitoring and timely information [15]. Taken together, prior studies support continuous data collection, automated indicators, risk scoring, and predictive analytics, but they also indicate that model usefulness depends on data quality, interpretability, governance, and the organizational capacity to respond to warning signals.

1.2 Research Gap

Although the literature provides established financial-ratio models and increasingly sophisticated digital prediction techniques, a practical gap remains in translating these approaches into an integrated monitoring architecture for industrial enterprises. Existing studies frequently concentrate on bankruptcy prediction accuracy or broad enterprise-risk principles, whereas less attention is given to how heterogeneous financial and operational data can be organized into monitoring frequencies, thresholds, risk scores, dashboards, and early-warning responses within a single managerial system. This study addresses that gap by developing a structured digital identification and monitoring framework tailored to liquidity, credit, profitability, market, currency, and operational financial risks.

1.3 Objectives of The Study

- a. To identify the major financial risks affecting industrial enterprises.
- b. To examine the role of digital technologies in financial-risk identification and monitoring.
- c. To develop an integrated system of digital indicators, risk scoring, thresholds, and early-warning mechanisms for managerial decision-making.

2. Materials and Methods

The study applies a combination of system analysis, comparative analysis, financial-ratio analysis, risk classification, and conceptual modelling.

The research methodology is based on the assumption that the financial condition of an industrial enterprise can be monitored through a system of interconnected indicators rather than through individual financial ratios. The proposed system includes six major risk groups: liquidity risk, credit risk, profitability risk, market risk, currency risk, and operational financial risk.

Liquidity risk is associated with the enterprise's ability to meet short-term obligations. Credit risk reflects potential losses arising from deterioration in the quality of receivables and other financial claims. Profitability risk represents the possibility of declining operating and net profitability. Market risk is associated with fluctuations in prices, demand, and other market factors. Currency risk becomes significant when enterprises have foreign-currency revenues, expenses, loans, or liabilities. Operational financial risk reflects financial consequences arising from disruptions in production, supply, technology, or internal processes.

The proposed digital monitoring system consists of four sequential stages:

Stage 1 — Data collection.

Financial statements, accounting records, cash-flow information, sales data, production indicators, receivables, payables, debt information, and relevant market indicators are collected automatically.

Stage 2 — Digital processing and analysis.

The collected information is integrated into a centralized analytical system. Financial indicators are calculated automatically and compared with established thresholds.

Stage 3 — Risk identification and scoring.

Each risk category receives a risk score based on the deviation of relevant indicators from acceptable levels. The system can classify risks into low, moderate, high, and critical categories.

Stage 4 — Early warning and managerial response.

When an indicator reaches a critical threshold, the system generates an alert for responsible managers. This allows corrective actions to be initiated before the financial problem becomes systemic.

The general structure can therefore be represented as:

Digital data → Processing → Risk indicators → Risk scoring → Early warning → Management decision → Monitoring

This methodology supports a transition from retrospective financial analysis toward continuous and preventive financial-risk management.

3. Results

The analysis demonstrates that digital monitoring can significantly expand the information base available for financial-risk management. Instead of relying exclusively on annual or quarterly financial statements, enterprises can establish continuous monitoring of key financial indicators.

A comprehensive digital monitoring system should include both traditional financial ratios and real-time operational indicators. For example, changes in accounts receivable, inventory turnover, cash balances, debt-service requirements, sales volumes, and production costs may provide early signals of emerging financial problems.

Table 1. Proposed system of digital financial-risk indicators

Risk category	Key indicators	Monitoring frequency	Early-warning signal
Liquidity risk	Current ratio, cash ratio, operating cash flow	Daily/weekly	Declining liquidity
Credit risk	Receivables turnover, overdue receivables	Weekly	Growth of overdue debt
Profitability risk	ROA, ROE, operating margin	Monthly	Persistent profitability decline
Market risk	Sales growth, product prices, demand	Weekly/monthly	Significant demand reduction
Currency risk	Foreign-currency liabilities, exchange-rate exposure	Daily/weekly	Sharp exchange-rate movement
Operational financial risk	Production cost, inventory turnover, downtime	Daily/weekly	Rising costs or production disruption

The table demonstrates that different financial risks require different monitoring frequencies. Liquidity and currency risks may require daily or weekly monitoring, while profitability indicators can generally be assessed monthly.

An important feature of the proposed system is the establishment of **risk thresholds**. For example, if liquidity indicators fall below the predetermined level, the system automatically generates an alert. Similarly, a rapid increase in overdue receivables can trigger a credit-risk warning.

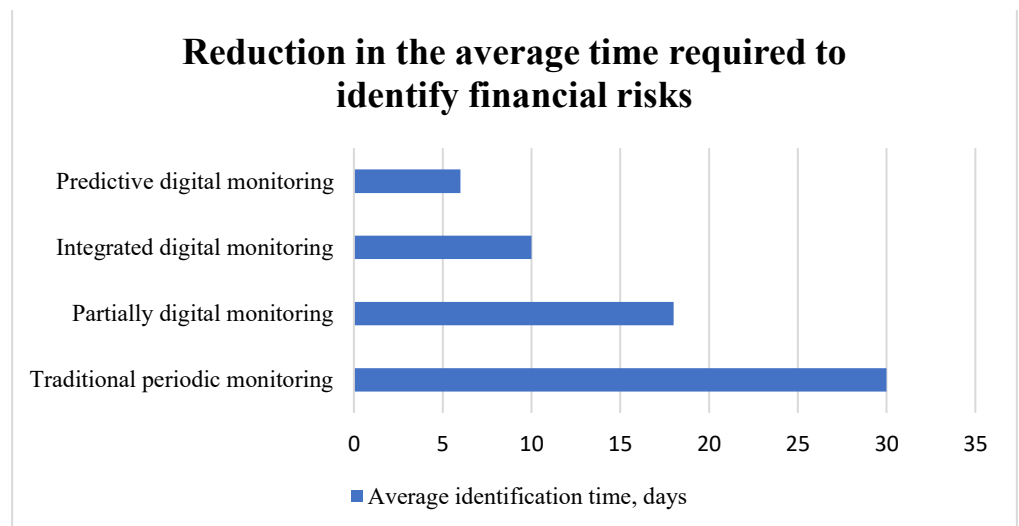


Figure 1. Reduction in the average time required to identify financial risks

The data illustrate a conceptual reduction in the time required to identify financial risks as enterprises move from traditional periodic monitoring toward integrated and predictive digital systems. The principal advantage of digital monitoring is not simply the automation of calculations but the ability to detect deviations earlier and provide information to managers in a timely manner.

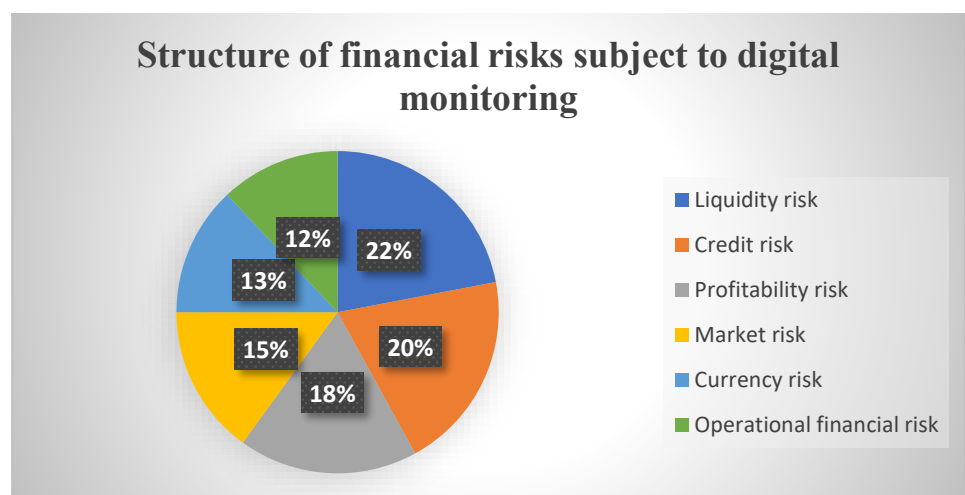


Figure 2. Structure of financial risks subject to digital monitoring

Liquidity and credit risks constitute the largest components of the proposed monitoring structure. This reflects the importance of maintaining sufficient financial resources and controlling receivables and other credit exposures. Profitability, market, currency, and operational financial risks complement the monitoring system and provide a broader assessment of the enterprise's financial condition.

The results indicate that the effectiveness of financial-risk management depends increasingly on the speed and quality of information processing. Traditional financial analysis remains important, but its periodic nature can limit the ability of managers to respond rapidly to emerging threats.

Digital monitoring provides several important advantages.

First, it increases the **frequency of financial analysis**. Indicators can be updated automatically instead of being calculated only at the end of a reporting period.

Second, digital systems improve **data integration**. Financial, accounting, production, sales, inventory, and market information can be combined within one analytical environment.

Third, digital monitoring supports **early-warning mechanisms**. Instead of simply documenting an existing financial problem, the system can identify abnormal changes in indicators and notify responsible managers.

Fourth, digital technologies create opportunities for **predictive analysis**. Historical data can be used to identify patterns associated with future deterioration in financial performance.

Fifth, digital dashboards can improve **managerial transparency**. Managers can monitor the current condition of major financial indicators through visual dashboards and risk maps.

However, digitalization does not automatically eliminate financial risks. Several organizational and technological conditions must be satisfied. These include high-quality data, cybersecurity, integration of accounting and operational systems, clearly defined responsibility for risk management, appropriate risk thresholds, and qualified personnel.

Therefore, digital monitoring should be considered not as a separate information-technology project but as an integrated component of the enterprise's financial-management system.

4. Discussion

Recommendations for Improving the Digital Monitoring System

Based on the results, the following directions for improvement are proposed:

1. Establish an integrated financial-risk database

Financial, accounting, production, sales, inventory, debt, and cash-flow information should be integrated into a unified analytical environment.

2. Introduce automated risk indicators

Key indicators should be calculated automatically, reducing manual processing and improving the timeliness of monitoring.

3. Develop a risk-scoring mechanism

Each major financial risk should receive a quantitative score based on the deviation of relevant indicators from established thresholds.

4. Introduce an early-warning system

The system should automatically notify responsible employees when predefined risk thresholds are exceeded.

5. Use predictive analytics

Historical financial data can be used to develop models that identify patterns associated with potential deterioration in liquidity, profitability, solvency, or credit quality.

6. Develop digital dashboards

Management dashboards should display the current financial position, risk levels, trends, and warning signals in a simple visual format.

7. Strengthen cybersecurity and data governance

Since digital monitoring depends on centralized financial information, access control, data protection, backup systems, and cybersecurity should become integral components of the monitoring architecture.

5. Conclusion

The study demonstrates that improving the digital identification and monitoring of financial risks can contribute to strengthening the financial stability of industrial enterprises. Traditional financial analysis remains necessary, but its effectiveness can be increased through automated data collection, continuous monitoring, risk scoring, predictive analytics, and early-warning mechanisms.

The proposed system combines financial and operational information into an integrated digital monitoring framework. Its main advantage is the transition from retrospective analysis toward preventive risk management. Continuous monitoring enables enterprises to identify negative changes in liquidity, credit quality, profitability, market conditions, currency exposure, and operational performance at an earlier stage.

The proposed approach also demonstrates that different financial risks require different monitoring frequencies and analytical tools. Liquidity and currency risks may require relatively frequent monitoring, while profitability and broader financial-stability indicators can be assessed over longer periods.

Further research may focus on developing econometric and machine-learning models for predicting financial distress at industrial enterprises and determining optimal risk thresholds using empirical data from specific industries.

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