UDK: 005.334:336.6(4-6EU) Ekonomski izazovi/ Economic Challenges,Year 14, no.29, pg. 10-23
657.375.3 doi: 10.5937/EkoIzazov2529010M Received/ Primljeno: 29.03.2025.
Originalni naučni rad / Original scientific paper Accepted/Prihvaćeno: 20.11.2025.

THE INTEGRATED SYSTEM OF THE EUROPEAN UNION FOR ANALYZING THE FINANCIAL PERFORMANCE OF COMPANIES AND EARLY WARNING OF BANKRUPTCY RISK

Tijana Matejić
University of Belgrade, Faculty of Organizational Sciences
Belgrade, Serbia
tmatejic@asss.edu.rs, *https://orcid.org/0000-0002-6965-4737*

Snežana Knežević
University of Belgrade, Faculty of Organizational Sciences
Belgrade, Serbia
snezana.knezevic@fon.bg.ac.rs, *https://orcid.org/0000-0001-9833-7274*

Stefan Milojević
University „Educons“, Faculty of Business Economics
Sremska Kamenica, Serbia
stefan.milojevic@educons.edu.rs, *https://orcid.org/0000-0001-6240-6776*

Abstract
The bankruptcy of an enterprise is a devastating phenomenon that affects not only the company undergoing bankruptcy, but also affiliated companies, investors, creditors, and society at large, and it can trigger a domino effect on the economy of the country in which the bankrupt company operated. Following the COVID-19 crisis period, during which the number of corporate bankruptcies in the EU declined due to massive EU and governmental supportive measures to mitigate the effects of the crisis, the fact that bankruptcies can be a lagging phenomenon, and the emergence of new macroeconomic and geopolitical destabilizing factors, the EU is facing a significant increase in the number of bankruptcies across most economic sectors and in the majority of its member states in the post-COVID period. At the same time, the EU is working on enhancing transparency in corporate operations by adopting new digitization strategies and designing a new system providing unified public access to information on company operations, including financial statements, namely the ESAP system. This paper presents a general platform model that utilizes Big Data technologies and machine learning algorithms, which expands the functionalities of the ESAP platform and additionally offers continuous analyses of the financial performance and risk of bankruptcy of specific companies, industries, economic branches, and sectors, national economies of member states, and the EU as a whole.
Keywords: bankruptcy, risk, management, sustainability

INTEGRISANI SISTEM EVROPSKE UNIJE ZA ANALIZU FINANSIJSKIH PERFORMANSI PREDUZEĆA I RANO UPOZORAVANJE NA RIZIK OD BANKROTA

Apstrakt

Bankrotstvo preduzeća je razorna pojava koja targetira ne samo preduzeće koje je predmet bankrotstva, već i povezna preduzeća, investitore, kreditore, društvo i može imati domino efekat u ekonomiji zemlje u kojem je poslovalo bankrotirano preduzeće. Nakon perioda COVID-19 krize u kojem je umanjen broj bankrotstava preduzeća u EU, usled masivnih mera podrške EU za sanaciju efekata COVID-19 krize, činjenice da bankrotstva mogu biti kaskajući fenomen kao i pojave novih makroekonomskih i geopolitičkih destabilišućih faktora, u 2024. godini EU se suočava sa značajnim problemom uvećanja broja bankrotstava u najvećem broju ekonomskih sektora i za najveći broj zemalja njenih članica, pri čemu je još u 2023. godini broj bankrotstava premašio razmere pojave ovog krajnjeg ishoda u poslovanju preduzeća iz pre-COVID perioda. EU istovremeno radi na unapređenju transparentnosti u poslovanju preduzeća, kroz donošenje novih strategija za digitalizaciju i projektovanje novog sistema za jedinstveni javni pristup informacijama vezanim za poslovanje preduzeća uključujući i njegove finansijske izveštaje. U radu se predstavlja opšti model platforme koji primenjuje Big Data tehnologije i algoritme mašinskog učenja, koja bi pored pristupa podacima o poslovanju preduzeća u EU obezbedila kontinuirani pristup analizama o uspešnosti u poslovanju partikularnih preduzeća, industrija, privrednih oblasti i sektora, nacionalnih ekonomija država članica i EU u celini.

Ključne reči: bankrotstvo, upravljanje, održivost

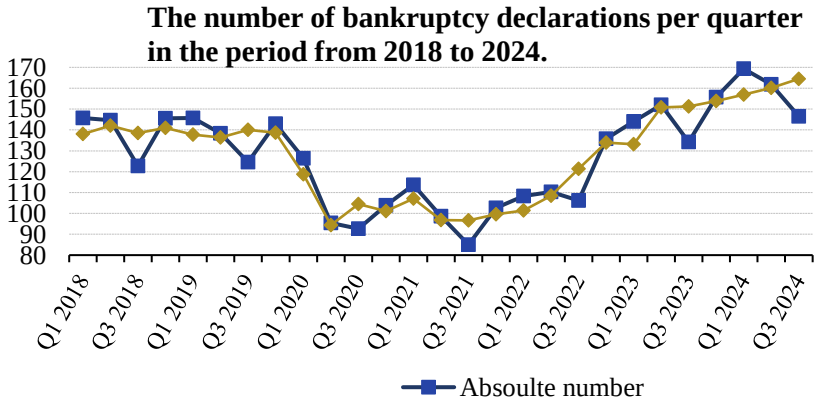
THE CONCEPT OF BANKRUPTCY AND BANKRUPTCY TRENDS IN THE EU

The video game industry Corporate bankruptcy is a significant event with far-reaching economic and social consequences. Understanding its causes and effects, as well as applying appropriate models for prediction and early identification, is essential for improving the business environment and preventing negative impacts on the economy and society as a whole. Bankruptcy is a legally regulated situation in which a company finds itself when it is unable to meet its obligations to creditors, requiring the settlement of debts from the total value of the bankrupt debtor's assets. As a devastating outcome of insolvency proceedings, bankruptcy not only affects the company itself but also a wide network of its business partners and stakeholders, jeopardizing invested funds during lengthy insolvency procedures and potentially leading to financial deterioration or even loss of liquidity for partner companies. It imposes enormous costs on the bankrupt company, affiliated businesses, society, and the national economy, while also resulting in a prolonged and exhaustive legal process. Furthermore, it has a broader negative impact on the national economy, contributing to rising unemployment, reducing gross domestic product, and diminishing tax revenues. Credit risk is a related concept to bankruptcy, representing the probability of financial loss when a debtor is unable to repay a debt or fulfil contractual obligations (Brown & Moles, 2014). Credit risk analysis is crucial for ensuring the sustainability and profitability of financial institutions as well as the broader economic ecosystem (Gootkind, 2023). Also related to bankruptcy is the

concept of corporate failure, which is generally used to describe financial failure, insolvency, business inactivity, ownership changes, and bankruptcy (Li et al., 2019). On the other hand, company liquidation is a process in which a company is voluntarily or forcibly closed. Unlike bankruptcy, a liquidating company is not necessarily insolvent, meaning that after creditors are settled, owners and shareholders also receive payments, and the liquidation process does not necessarily involve a court (Business Registers Agency, 2023). In the post-COVID era, the importance of studying bankruptcy has been further emphasized, considering that bankruptcies are a lagging phenomenon (Dun & Bradstreet Worldwide Network, 2023). Massive government support measures to mitigate the effects of the COVID-19 crisis, along with temporary adaptations in corporate business policies, have potentially delayed the crisis's impact on bankruptcy occurrences (Matejić et al., 2022). The post-COVID-19 economic recovery has not been without challenges: regional and market segment disparities persist, labor shortages remain an issue, and supply and demand imbalances continue. Meanwhile, external macroeconomic factors such as high inflation rates and geopolitical tensions exert additional pressure on national economies (World Economic Forum, 2024). Furthermore, additional pressures on business survival arise from sophisticated consumer behavior, competitive activities, economic and political pressures, rising living costs, supply chain disruptions, reduced budgets, and higher taxes (Financier Worldwide Magazine, 2024). According to a report from the Eurostat portal (Eurostat, 2024), as shown in Figure 1, the number of bankruptcy declarations in the European Union declined in the first half of 2020, which can be attributed to support measures introduced at the onset of the COVID-19 crisis that temporarily prevented bankruptcies during this period. Until the end of 2021, the number of bankruptcies remained below pre-COVID levels. However, following this period, a rising trend in bankruptcies has been observed, culminating in the third quarter of 2024, with the highest number of bankruptcies initially recorded in the second quarter of 2023, followed by a continued period of steady growth, reaching a new peak in the third quarter of 2024.

Figure 1

Number of bankruptcy declarations in the eu per quarter



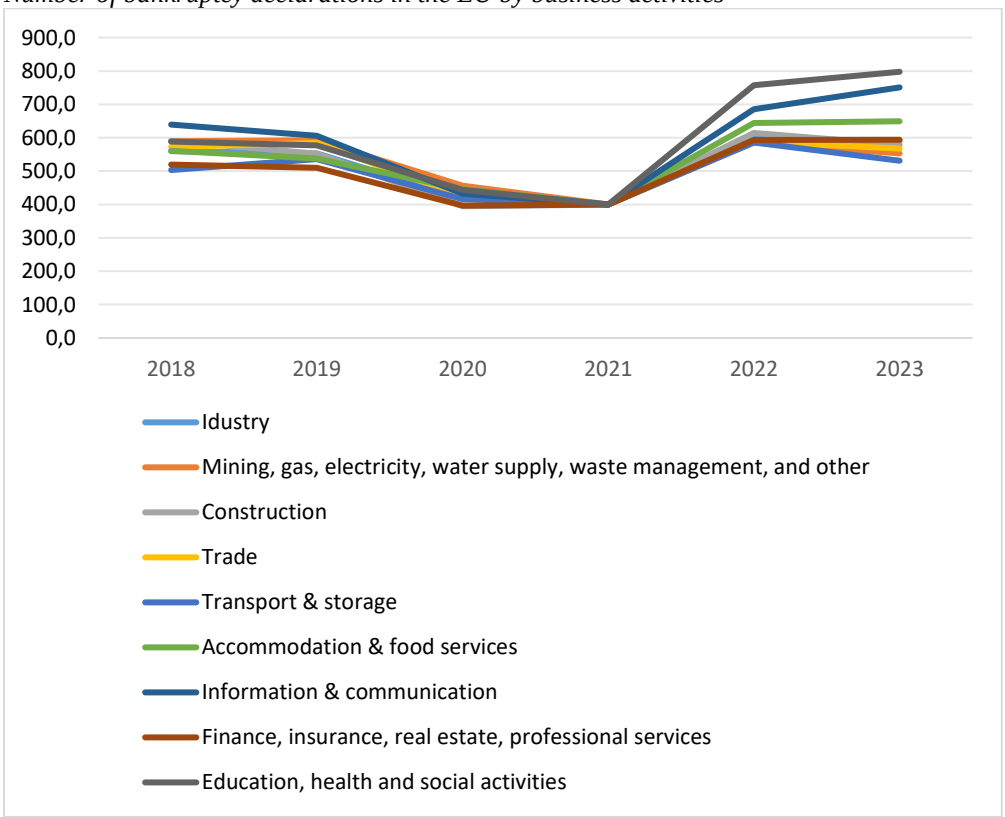
Source: Eurostat (online data code: (sts_rb_q))

As shown in Figure 2, in 2022, the number of bankruptcies in the EU increased across all types of businesses based on their activity. However, in 2023, the number of bankruptcies slightly decreased for a larger number of business sectors, remaining roughly at the same level as in 2021 in the financial services sector, real estate services, insurance, professional services, as well as accommodation and food services. In contrast, bankruptcies were significantly increased among companies involved in information and communication, education, healthcare services, and social activities (Eurostat, 2024). In the first three quarters of 2024, according to the Eurostat portal, for which data on bankrupt companies in the EU are available, the number of bankruptcies increased across all business activity groups compared to the first three quarters of 2023, except for companies engaged in education, healthcare services, and social activities. The largest percentage increase in bankruptcies was observed in the transportation and storage sector, which saw a 23.6% rise, followed by the accommodation and food services sector, which saw a 16.4% increase.

The European Union is therefore facing an escalating problem with increasing bankruptcies, where early identification and transparency regarding business groups, economic sectors, national economies, and specific companies facing a heightened risk of bankruptcy can help reduce the number of bankruptcies and prevent wrong investments by creditors and investors.

Figure 2

Number of bankruptcy declarations in the EU by business activities



Source: Eurostat (online data code: (sts_rb_q))

EU INITIATIVES FOR ENHANCING CORPORATE TRANSPARENCY

Transparency is one of the key principles of the European Union, requiring the EU to make information on policy development and spending publicly available while upholding the principle of freedom of information. The Accounting Directive (2013/34/EU) and the Transparency Directive (2004/109/EC) are two fundamental EU regulations that work synergistically to improve transparency and harmonization in corporate reporting across the EU. These directives are continuously updated to align with broader EU legislation, including new standards for sustainability and transparency.

In the European Union, the obligation to submit financial reports, along with the structure and rules for corporate financial reporting, is currently regulated by Directive 2013/34/EU (the Accounting Directive). This directive applies to capital companies, including limited liability companies, public and private joint-stock companies, and other corporate forms that national laws in member states may equate with these entities. It covers subsidiaries of foreign companies but does not include non-profit organizations. The directive aims to enhance corporate transparency and improve comparability among financial reports of companies in EU member states. It mandates that companies, depending on their size and structure, maintain financial statements in a prescribed format, including a balance sheet, income statement, and various supplementary reports. Larger companies are also required to submit a management report on business performance. These financial reports must be filed annually with national registers defined by the member states. This directive establishes a common framework for corporate financial reporting across EU member states by defining a unified structure and reporting rules. However, member states have some flexibility in their implementation, particularly in setting thresholds for different categories of businesses with varying reporting requirements. This flexibility is especially evident for micro and small enterprises, which may receive some exemptions from reporting obligations. Additionally, member states define the rights, levels, and means of public access to these documents according to their national legislation. As a result, financial reporting and public availability of these documents vary across EU member states. For example, in Denmark, financial reports for limited liability companies and joint-stock companies are fully publicly accessible, whereas in Sweden and Finland, partial access is granted, or a fee is required to obtain financial statements. Furthermore, deadlines for submitting reports and specific reporting requirements may differ among member states.

The Transparency Directive (2004/109/EC) focuses on issuers of securities whose instruments are traded on regulated markets within the EU. This directive establishes rules for the disclosure of financial and non-financial information, including annual and semi-annual reports, significant market-impacting events, changes in ownership structure within joint-stock companies, and other relevant information affecting the price of issued securities. According to this directive, issuers of securities must submit their reports in the European Single Electronic Format (ESEF), and these reports must include consolidated financial statements in compliance with International Financial

Reporting Standards (IFRS). The primary goal of this directive is to enhance transparency for investors and protect financial markets from manipulation.

The Business Registers Interconnection System (BRIS) is a network linking business registers across EU member states, providing a single access point to company data via the E-Justice Portal. It is designed to facilitate easier access to information on companies registered in the EU, Norway, Iceland, and Liechtenstein, accelerating and simplifying data exchange, particularly in the case of cross-border transactions and legal proceedings (European Commission, 2017). BRIS is part of the EU's broader strategy to increase transparency and harmonization of business information within the Single Market. This system provides general company information, such as incorporation details, registration status, management data, and, in some cases, financial reports. In March 2023, the European Commission introduced a proposal to expand and improve the use of digital tools and processes. This proposal highlights that relevant information about businesses is still not sufficiently available on national business register platforms or through the BRIS platform, with existing challenges and limitations in data accessibility (European Commission, 2023). The proposal underscores that some crucial data, such as corporate governance details, principal places of business, or corporate group structures, remain unavailable at the EU level and are rarely accessible in national registers. Additionally, data on other economic entities, such as partnerships, which play a vital role in national economies, are not available at the EU level. This proposal includes several key measures, such as the implementation of a "once-only" principle, ensuring that companies do not need to resubmit information when registering a branch or subsidiary in another member state, more frequent data exchange between business registers via the BRIS platform, public and free access to company certificates containing basic company information, authorization for lawyers to represent companies in other member states, integration of the BRIS system with insolvency registers, and other improvements aimed at increasing transparency and efficiency.

As part of the new 2020 action plan, "Capital Markets Union for People and Businesses – New Action Plan" (CMU Action Plan, European Commission, 2020), the European Commission acknowledged the need to improve public access to corporate information, including that of companies, firms, and financial institutions. It also recognized the necessity of enhancing public access to financial and non-financial information of businesses within the EU by establishing a European Single Access Point (ESAP) for such data. The Digital Finance Strategy, introduced by the Commission in the same year, defined the general framework for digital financial transformation in the coming years, particularly in promoting data-driven finance. According to this 2020 strategy, the European Commission advocates for the creation of nine data spaces to stimulate innovation, market transparency, sustainable finance, and business access to financial resources through enhanced data sharing, thereby fostering a more integrated market (Cyber Risk GmbH (n.d.)). The goal is to establish a unified EU-level data space that protects personal and sensitive business information while ensuring open access to high-quality industrial data, thereby stimulating growth and value creation ((Cyber Risk GmbH (n.d.)).

ESAP aims to provide a centralized, digital, and unified access point for information and data from various sources across different EU member states. It seeks to enhance transparency and data availability for investors, companies, regulators, academia, and other stakeholders while supporting sustainable investments by facilitating access to information on companies' financial, environmental, social, and governance (ESG) aspects. The system is intended to cover companies already required to disclose financial and other reports under existing EU regulations, as well as small and medium-sized enterprises (SMEs) that can voluntarily make their information publicly available to increase transparency and attract investors. ESAP is designed to function as a two-layer system, where businesses first submit data to EU agencies, offices, and national authorities, which then transmit structured data to the ESAP platform. The system is planned to begin collecting data in July 2026, while public data dissemination – accessible via API or direct download – is set to commence after July 2027 (Cyber Risk GmbH (n.d.)).

MODEL OF A PLATFORM FOR BUSINESS PERFORMANCE ANALYSIS AND EARLY WARNING OF POTENTIAL CORPORATE BANKRUPTCY IN THE EU

The objective of the proposed technical system is the automatic integration of data from various national business registers in real-time, utilizing Big Data technologies for collecting, processing, and analyzing corporate financial performance data. Additionally, machine learning algorithms would be applied to identify companies, business groups, industries, and national economies with an increased risk of bankruptcy. Such a system could enhance the functionalities of the future ESAP system, which is currently under development. In addition to serving as a centralized access point for corporate business data, the proposed system would leverage Big Data analytics provided by EU authorities to offer continuous insights into the business performance of individual companies, industries, economic sectors, national economies of EU member states, and the EU as a whole. Furthermore, the system would enable the retrieval of data at various levels of processing for research purposes by academic and professional institutions. Moreover, this system envisions the implementation of early warning mechanisms to detect high-risk activities, corporate groups, and individual businesses that may face devastating bankruptcy scenarios. By providing such insights, the system would contribute to the development of strategic policies and action plans to support and stimulate various economic sectors across EU member states. It would also facilitate better coordination of economic policies within the EU and enable timely interventions by regulatory bodies, investors, management structures, and creditors regarding businesses with heightened financial risk and potential insolvency.

The proposed system is designed to collect, process, store, and analyze Big Data using a batch processing approach and machine learning algorithms to identify high-risk businesses, sectors, and national economies. It would also monitor bankruptcy risk trends and actual bankruptcies among companies operating within the EU. Additionally, it could potentially integrate companies from countries in the process of

joining the EU. Data is classified as Big Data when its volume, variety, and velocity reach levels that limit the effectiveness of traditional storage and processing techniques (Pflugfelder, 2013). Big Data has significant potential for improving financial decision-making, risk management, fraud detection, and operational efficiency (Sihombing *et al*., 2023). It enables the extraction of relevant insights from large datasets using advanced analytics and facilitates timely financial reporting (Xie, 2022). A growing number of studies focus on methods for financial risk analysis, assessment, and prediction using Big Data technologies (Cheng *et al*., 2021).

Bankruptcy prediction is a field in data science that continues to attract the attention of both the academic and professional communities due to the clear benefits of preventing bankruptcy, not only for companies at risk and their associated partners, creditors, and investors but also for the broader society and economy of a country. Through the development of advanced analytical techniques that incorporate machine learning and deep learning algorithms, the accuracy of bankruptcy assessment and prediction has improved over time (Wang *et al*., 2024). A review of machine learning and deep learning techniques applied to bankruptcy prediction can be found in the study by Qu *et al*. (2019). Machine learning (ML) is a concept with significant potential, particularly when combined with Big Data, as large datasets allow ML algorithms to uncover more nuanced and subtle patterns, leading to more precise predictions and assessments of analyzed indicators. However, this integration also presents challenges related to the scalability of models and distributed computing (Zhou *et al*., 2017). ML focuses on designing computer systems that automatically improve through experience (Gandomi & Haider, 2015). Despite its advantages, applying ML algorithms in combination with Big Data introduces numerous challenges that must be considered when developing systems that integrate these two concepts. As data volumes increase, algorithm performance becomes increasingly dependent on the architecture used for data storage. Some algorithms face difficulties in adapting to parallel processing, and issues may arise when dealing with imbalanced datasets, the "curse of dimensionality," model performance degradation due to data noise and heterogeneity, and other related problems (Zhou *et al*., 2017). Additionally, one of the fundamental requirements of systems that use Big Data analytics and ML tools for bankruptcy prediction is the need for continuous updates of ML models based on new data (Hafiz *et al*., 2015).

The general model of the EU's centralized platform for financial performance analysis and bankruptcy risk assessment, based on Big Data technologies and implementing machine learning, is presented in Figure 3 and includes several key components:

1. The Data Ingestion Module automatically collects data about companies from national registries of member countries relevant to the financial performance of businesses, including data on bankrupt companies, general company information such as size, number of employees, industry, sector, company type, management structure, and more, as well as macroeconomic and market indicators for the economy as a whole (e.g., inflation rate, unemployment, GDP) and for individual industries from national registries for statistical analysis and reporting (e.g., GDP share, number of employees, demand, etc.), as well as from other institutions for

macroeconomic analyses at the EU level using APIs (such as REST API, GraphQL, etc.). This module includes an API gateway, which serves as the central point for communication with the APIs of national registries and statistical offices, ensuring validation of requests, i.e., checking the correctness and integrity of input parameters, and API authorization and authentication using protocols such as OAuth 2.0, token-based authorization, and others. Additionally, this layer implements a framework for batch data retrieval from APIs and their storage first in the raw data storage and, after ETL (Extract, Transform, Load) processing, in the processed data storage. Technologies such as Apache NiFi or others can be used to define the data collection schedule, enable data retrieval automation, transformation, and the execution of ETL processes in real-time.

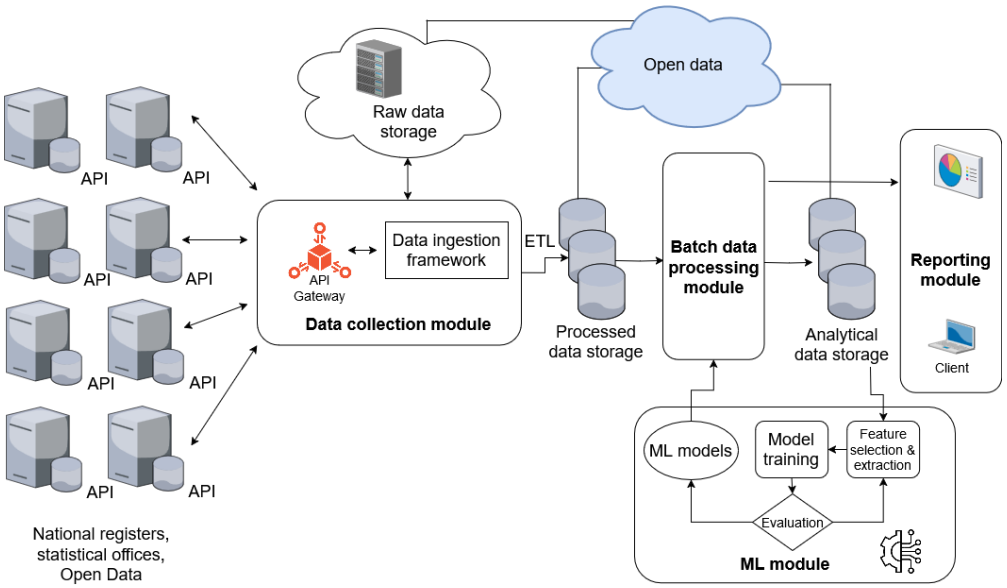
2. The Data Storage Module includes three storage layers: raw data storage, processed data storage, and analytical data storage. After data ingestion, the data is directly stored in raw data storage, which serves as a Data Lake that can be based on technologies such as Amazon S3, Google Cloud Storage, and Azure Blob Storage. These technologies provide storage for large volumes of structured, semi-structured, and unstructured data, ensuring scalability, flexible data analysis using various tools and technologies, and cost efficiency compared to traditional data warehouses. Once stored in this layer, the data collection module applies ETL processes to clean, transform, and standardize the data before moving it to processed data storage. In this architecture, ETL processes are not applied directly during data collection to ensure that data is stored in its original format, allowing for data verification and auditing at later stages, process reproducibility, retrieval, and use of raw data for additional analyses by third parties, and ensuring that ETL processes remain separate and independent from primary data collection. After ETL processing, data is stored in processed data storage in a format suitable for analytics. This storage can be based on technologies such as Data Lakes, Data Warehouses (using solutions like Redshift, BigQuery, Snowflake, etc.), SQL and No-SQL database management systems, or a combination of these solutions. After processing, data from the processed data storage is subjected to batch processing, during which aggregated, summarized, and prepared analytical data – resulting from statistical processing and descriptive analyses – is transferred to analytical data storage and the reporting module. The analytical data storage can implement solutions such as OLAP cubes (e.g., SSAS, Apache Kylin) and analytical Data Warehouses (e.g., Snowflake, BigQuery, etc.). Storing and separating data at different levels of processing and analysis not only provides better insight into potential processing errors and extends the scope of data analysis but also enables data sharing in various formats with the scientific community and the general public, who can use it for further analysis and research.

3. The Batch Processing Module performs statistical processing, grouping, descriptive and exploratory data analysis to identify patterns and trends in data (e.g., an increase in the number of businesses with an elevated risk of bankruptcy). The implementation of this module can use Big Data frameworks

such as Apache Spark, Hadoop Map Reduce, statistical analysis and processing tools such as R and Python, SQL, and OLAP and Business Intelligence tools such as Microsoft SQL Server Analysis Services, Snowflake OLAP, Apache Kylin, and others.

4. The ML Module covers key aspects of developing, training, validating, and deploying machine learning models, with a focus on anomaly detection, business clustering, and predictive analytics. This module includes processes such as (1) *feature engineering and selection*, identifying significant indicators using processed data from analytical data storage through methods like Principal Component Analysis and Feature Importance (using algorithms such as Random Forest, XGBoost, and Multiple Discriminant Analysis); (2) *model training*, including classification models such as Logistic Regression, Random Forest, Gradient Boosting, Artificial Neural Networks, scoring techniques such as Altman, Zmijewski, and Springate, bankruptcy time prediction using models like Cox proportional hazards, anomaly detection in time series using LSTM (Long Short-Term Memory), SARIMA, Autoencoders, as well as clustering algorithms like K-means and DBSCAN for business grouping; (3) *model testing and performance evaluation* using various accuracy indicators and technologies such as MLflow and TensorBoard; and (4) *model integration* into the batch processing workflow. This module can leverage technologies such as MLflow for experiment management, model training, and deployment, libraries such as Scikit-learn, TensorFlow, and PyTorch for model development, Kubeflow for orchestrating ML pipelines in Kubernetes environments, AWS SageMaker and Google Vertex AI for serverless training and model deployment, among others. The ML module utilizes data from analytical data storage, which has undergone multiple processing steps through ETL and batch processing to be optimized for machine learning algorithms.
5. The Reporting Module is responsible for generating visual and textual reports for users using tools such as Tableau and Power BI for reporting, graphic libraries such as D3.js and Plotly, and for generating bankruptcy risk alerts for businesses, industries, and sectors via Slack, Email, or SMS Gateway services.
6. The Orchestration & Monitoring Module is responsible for orchestrating all API calls, ETL, ML, and analytical processes, for which technologies such as Apache Airflow can be used to manage workflows and large-scale data processing. This module also includes components for infrastructure performance monitoring (e.g., Prometheus + Grafana), system logging and analysis (e.g., the ELK stack consisting of Elasticsearch, Logstash, and Kibana), and tracking machine learning processes and model performance using tools such as Evidently AI.

Figure 3
The architecture of the integrated system for analyzing the financial performance of companies



Source: Authors

The proposed model should ensure the scalability of the infrastructure, for which Cloud platforms, service architecture, and Kubernetes can be used for orchestration and service scaling; robustness, i.e., a modular approach in developing its infrastructure, which can reduce errors in individual subsystems; automation to minimize manual work; and compliance with GDPR (General Data Protection Regulation) standards, which regulate the way personal data of EU citizens, who may be users of this system, are collected, processed, stored, and used at the EU level.

CONCLUSION

The European Union continuously demonstrates its commitment to increasing transparency in business operations and reporting as a key step toward enhancing trust, competitiveness, and sustainability in the common market. Transparency enables investors, regulatory bodies, and citizens to make informed decisions while providing businesses with a framework for aligning with high standards of corporate governance and sustainability. The EU's current and future measures, based on data digitization and interoperability, ensure better visibility of economic activities, reduce corruption and business fraud, and create a more favorable business environment in which all actors operate responsibly and in line with the EU's shared values.

The presented system enhances the EU initiative to build a single access point for business data (ESAP) through the integration of functions for analyzing business performance data, financial risks, and bankruptcy risks of companies and business groups, the incorporation of machine learning functionality for early identification of bankruptcy risks, and the possibility of sharing large volumes of data with these analyses and original data with the academic community and other stakeholders. In this way, transparency in business operations can be further improved, providing a foundation for enhancing strategies and action plans, as well as support measures to minimize the destructive and increasingly prevalent phenomenon of bankruptcy in the European economic space. This system enables the development of more efficient policies for managing the risk of bankruptcy at the EU level and improves transparency in the EU business space.

REFERENCES

1. Agencija za privredne registre (2023). Brisanje. Preuzeto sa: https://www.apr.gov.rs/registri/privredna-drustva/uputstva/brisanje.2032.html
2. Brown, K., & Moles, P. (2014). Credit Risk Management, Edinburgh Business School Heriot-Watt University, United Kingdom.
3. Business Register Interconnection System (BRIS), https://ec.europa.eu/digital-building-blocks/sites/pages/viewpage.action?pageId=533365899
4. Cheng, X., Liu, S., Sun, X., Wang, Z., Zhou, H., Shao, Y., & Shen, H. (2021). Combating emerging financial risks in the big data era: A perspective review. *Fundamental Research*, *1*(5), 595-606.
5. Cyber Risk GmbH (n.d). The European Financial Data Space (EFDS), Preuzeto sa: https://www.european-financial-data-space.com/
6. Cyber Risk GmbH (n.d).The European Single Access Point (ESAP). https://www.european-financial-data-space.com/European_Single_Access_Point_(ESAP).html
7. Dun & Bradstreet Worldwide Network (2023). Global Bankruptcy Report - 2023. Preuzeto sa https://www.dnb.com/content/dam/english/economic-and-industry-insight/DnB_Global-Bankruptcy-Report_2023.pdf
8. EUR- LEX. Directive 2004/109/EC of the European Parliament and of the Council of 15 December 2004 on the harmonisation of transparency requirements in relation to information about issuers whose securities are admitted to trading on a regulated market and amending Directive 2001/34/EC, https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32004L0109
9. European Commission (2017), A Connecting Europe Success Story, Business Register Interconnection System (BRIS). Preuzeto sa: https://ec.europa.eu/digital-building-blocks/sites/pages/viewpage.action?pageId=533365899
10. European Commission (2020). Capital markets union 2020 action plan: A capital markets union for people and businesses, Preuzeto sa: https://finance.ec.europa.eu/capital-markets-union-and-financial-markets/capital-markets-union/capital-markets-union-2020-action-plan_en
11. European Commission (2023), Proposal for a Directive to further expand and upgrade the use of digital tools and processes in company law. Preuzeto sa: https://commission.europa.eu/document/95b702df-2add-452f-922d-b61812c50dde_en
12. Eurostat (novembar 2024). Quarterly registrations of new businesses and declarations of bankruptcies - statistics. Preuzeto sa: https://ec.europa.eu/eurostat/statistics-

explained/index.php?title=Quarterly_registrations_of_new_businesses_and_declarations_of_bankruptcies_-_statistics#Quarterly_comparison_in_the_EU_and_euro_area
13. Financier Worldwide Magazine (February 2024). Global insolvencies in 2024: trouble on the horizon? Preuzeto sa: https://www.financierworldwide.com/global-insolvencies-in-2024-trouble-on-the-horizon
14. Gandomi, A., & Haider, M. (2015). Beyond the hype: Big data concepts, methods, and analytics. *International journal of information management*, *35*(2), 137-144.
15. Gootkind, C. (2023). Fundamentals of credit analysis - CFA Program Curriculum level I. Preuzeto sa: https://www.cfainstitute.org/en/membership/professional-development/refresher-readings/fundamentals-credit-analysis
16. Hafiz, A., Lukumon, O., Muhammad, B., Olugbenga, A., Hakeem, O., & Saheed, A. (2015, March). Bankruptcy prediction of construction businesses: towards a big data analytics approach. In *2015 IEEE first international conference on big data computing service and applications* (pp. 347-352). IEEE.
17. IFRS Accounting standards (n. d.), Raspoloživo na: https://www.ifrs.org/issued-standards/list-of-standards/
18. Li, H., Xu, Y. H., Li, X. R., & Xu, H. (2019). Failure analysis of corporations with multiple hospitality businesses. *Tourism Management*, *73*, 21-34.
19. Matejić, T., Knežević, S., Arsić, V. B., Obradović, T., Milojević, S., Adamović, M., Mitrović, A., Milašinović, M., Simonović, D., Milošević, G., & Špiler, M. (2022). Assessing the impact of the COVID-19 crisis on hotel industry bankruptcy risk through novel forecasting models. *Sustainability*, *14*(8), 4680.
20. Official Journal of the European Union (2013), L182/19, DIRECTIVE 2013/34/EU OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 26 June 2013 on the annual financial statements, consolidated financial statements and related reports of certain types of undertakings, amending Directive 2006/43/EC of the European Parliament and of the Council and repealing Council Directives 78/660/EEC and 83/349/EEC. Preuzeto sa: https://eur-lex.europa.eu/eli/dir/2013/34/oj/eng
21. Pflugfelder, E. H. (2013). Big data, big questions. Communication Design Quarterly Review, 1 (4), pp. 18-21.
22. Qu, Y., Quan, P., Lei, M., & Shi, Y. (2019). Review of bankruptcy prediction using machine learning and deep learning techniques. *Procedia Computer Science*, *162*, 895-899.
23. Sihombing, R. P., Narsa, I. M., & Harymawan, I. (2023). Big data analytics and auditor judgment: an experimental study. Accounting Research Journal, 36(2/3), 201-216.
24. Wang, X., Kräussl, Z., & Brorsson, M. (2024). Datasets for Advanced Bankruptcy Prediction: A survey and Taxonomy. *arXiv preprint arXiv:2411.01928*.
25. World Economic Forum (2024), Travel & Tourism Development Index 2024. Preuzeto sa https://www.weforum.org/publications/travel-tourism-development-index-2024/in-full/executive-summary-4c15006478/
26. Xie, H. (2022). Role of big data in the accounting profession. International Journal of Management and Education in Human Development, 2(1), 324-326.
27. Zhou, L., Pan, S., Wang, J., & Vasilakos, A. V. (2017). Machine learning on big data: Opportunities and challenges. *Neurocomputing*, *237*, 350-361.

REZIME

Rad se bavi problematikom porasta broja bankrotstava preduzeća u EU nakon perioda COVID-19 krize, tokom kojeg su masovne mere podrške privremeno smanjile ovaj negativni trend. Međutim, sa postepenim povlačenjem ekonomskih podsticaja i pojavom novih makroekonomskih i geopolitičkih izazova, dolazi do pogoršanja situacije po pitanju bankrotstva. U cilju povećanja transparentnosti poslovanja, EU donosi strategije za digitalizaciju i razvoj sistema za jedinstveni javni pristup podacima o preduzećima, uključujući njihove finansijske izveštaje. Predloženi model platforme zasnovan na Big Data tehnologijama i algoritmima mašinskog učenja omogućava pristup analizama poslovanja na nivou pojedinačnih preduzeća, industrijskih sektora i ekonomija država članica. Dodatno, sistem podržava inicijativu za izgradnju Evropske jedinstvene tačke pristupa poslovnim podacima (ESAP), integrišući analize finansijskih rizika i bankrotstava, kao i funkcionalnosti za rano otkrivanje finansijskih problema korišćenjem veštačke inteligencije. Time se jača okvir za odgovorno poslovanje, smanjuje prostor za korupciju i prevare, te unapređuju strategije za upravljanje rizicima bankrotstva na nivou cele EU. Ovaj pristup omogućava akademskoj zajednici i drugim zainteresovanim stranama pristup obimnim analizama, čime se dodatno osnažuje kreiranje politika koje mogu ublažiti negativne posledice bankrotstva u evropskom ekonomskom prostoru.