A proposed AI-Based Approach to Improving Fiscal Performance

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Abstract

Modern technologies, including Big Data analytics, AI, and Blockchain, have emerged to meet the evolving needs of society and the companies that provide a diverse range of products and services. There has been a growing interest in data quality and employing employment information to extract actionable insights, aiming to enhance lives in businesses, industry, government, and various services. Furthermore, the world faces turbulent times, marked by numerous threats such as COVID-19 and associated social and political conflicts. The pandemic has presented significant challenges for governments and citizens across the globe. In developing countries, the financial sector has already implemented Financial Management Information Systems (FMIS) and Performance-Based Budgets to ensure thorough oversight of budget estimates while enhancing the accuracy, effectiveness, and efficiency of government revenues and expenditures

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However, it is unable to overcome the financial challenges posed by external crises. To address this, we examined studies that offer innovative early warning systems aimed at bolstering financial management through the use of Data Science and AI techniques. Additionally, we proposed the development of a Financial Management Information System (FMIS) that incorporates a data-driven approach to enhance prediction and control within financial management.

Keywords: Financial Management, Enterprise System, Financial Information System, Artificial Intelligence.

نهج مقترح قائم على الذكاء الاصطناعي لتحسين الأداء المالي

الملخص

لقد ظهرت التقنيات الحديثة، مثل (تحليلات البيانات الضخمة، والذكاء الاصطناعي، والبلوك تشين، وغيرها) لمواكبة احتياجات المجتمع والشركات التي تقدم منتجات وخدمات من مختلف الأنواع. وقد زاد الاهتمام بجودة البيانات ومعلومات التوظيف لاستخراج المعرفة العملية للمساعدة في تحويل حياة الناس في الشركات والصناعة والحكومة والخدمات. علاوة على ذلك، يشهد العالم أوقاتًا مضطربة، مع تهديدات متعددة مثل جائحة كورونا (كوفيد-١٩) والصراعات الاجتماعية والسياسية المرتبطة بها. لقد فرض الوباء تحديات كبيرة على الحكومات ومواطنيها في جميع أنحاء العالم. في البلدان النامية، طبق القطاع المالي بالفعل أنظمة معلومات الإدارة المالية والميزانيات القائمة على الأداء لضمان التدقيق السليم لتقديرات الميزانية وضمان (دقة وفعالية وكفاءة) الإيرادات والنفقات الحكومية. ومع ذلك، لا يمكنه مواجهة العقبات المالية الناتجة عن الأزمات الخارجية. لذلك، استكشفنا الدراسات التي توفر إنذارًا مبكرًا جديدًا لتعزيز الإدارة المالية لمواجهة هذه الصعوبات من خلال استغلال تقنيات علوم البيانات والذكاء الاصطناعي. كما اقترحنا تطوير نظام معلومات إدارة مالية من خلال إضافة نهج قائم على البيانات يعزز التنبؤ والتحكم في الإدارة المالية.

الكلمات المفتاحية: الإدارة المالية. نظام المؤسسة. الذكاء الاصطناعي.

1 Introduction

The advent of modern technologies, including Big Data analytics, AI, and Blockchain, has emerged in response to the evolving needs of society and the diverse range of products and services offered by companies. As a result, there is a growing emphasis on data quality and the effective use of information to extract valuable insights, which can significantly transform lives across business, industry, government, and various services. Additionally, the world faces turbulent times marked by multiple threats, such as the COVID-19 pandemic and ongoing social and political conflicts. This global crisis has presented substantial challenges for both governments and their citizens.[1]. In summary, policymakers have confronted a dual challenge: the need for quick economic assessments and the swift evaluation of external shocks' impacts. In such situations, adopting new technologies and digital transformation is not just an option but a necessity for governments to effectively respond to these crises.[2]. The pandemic has significantly affected digital government's (DGT) transformation in recent years. As a result, governments worldwide must enhance their ability to strategically utilize new intelligent technologies and create innovative, smart public services to address and overcome the challenges posed by the pandemic [3]. Certain regions, particularly in the Middle East and North Africa (MNA), with a significant presence of commodity exporters, are expected to benefit from the soaring prices of oil, agricultural products, and select metals. Nonetheless, factors such as heightened political uncertainty, price volatility, increasing input costs, and a downturn in global demand are anticipated to curb new investments, including those in the extractive sectors.[4].

At the other time, we find that automating financial management operations and applying programs-performance budget systems are the most important recommendations of

international organizations for developing countries such as (Egypt, Jordan, and Turkey). Developing countries have begun implementing international organizations' requests for economic reform initiatives (UN, World Bank, etc.) Developing financial and administrative operations to enhance financial sector performance, but only marginally. In the FMIS state, governments worldwide have made serious reforms affecting public sector management and service delivery. While the public sector has been classified according to erroneous principles, inefficiencies, corruption, and the waste of public funds and resources, The reform program has been primarily promoted. Hence, an information system created to allow resource allocation efficiency and improve managerial decision-making by offering timely financial allocations and other aid-related information to facilitate economic development is called (FMIS). Despite the importance of IFMS, a variety of empirical studies show that the implementation of IFMS has experienced difficulties with organizations in the implementation phase. For instance, the failures linked with the system might be categorized broadly as resulting from technological, organizational, and political issues.

Although IFMIS has provided significant assistance to PFM in Africa, there have also been several challenges. [5] noted that corruption and other white-collar crimes are among the challenges facing the adoption of IFMIS in Africa. [6] acknowledged some challenges, such as data migration, corruption, and functional and implementation challenges. Corruption is a critical factor that affects the use and effective adoption of the IFMIS in African countries such as South Africa and Nigeria. Additionally, scholars have used various models of the determinants of implementation of IFMIS. [7] noted that the factors in the adoption of IFMIS are classified into three levels: contextual, institutional, and individual. It

should be pointed out that the factors linked to user capacity and technological factors are paramount within the context of Zambia, observing the system complexity, absence of a clear picture of the benefits the users acquire from the system, as well as lack of top managerial support. In Egypt, an inaccuracy followed in the estimates of uses and services of the state's general budget, which led to a discrepancy for most of the 13 years between the actual deficit and the goal [8]. The state budget deficit for 2005/06 happened on the final account of the state's general budget for 2011/2012. The high percentage of deviation between the target of the actual deficit and the real deficit changed the negative impact on many sectors—factors raising the value of public debt and thus increasing the cost of operating it.

In the context of the programs and performance budget system, budget formulation is the phase in which resources are allocated before their submission to the Legislative Assembly for review and final approval. It is the responsibility of the organization's directors to conduct thorough scrutiny of budget estimates and ensure the accuracy, effectiveness, and efficiency of government revenues and expenditures. Other well-known [9] noted that Countries implementing this new budgeting method take into account indicators of quality, efficiency, and effectiveness when formulating government budgets. Performance-based budgeting works in collaboration with federal government agencies to identify how treasury grants can be allocated for public services and products, ensuring the effectiveness and efficiency of this budgeting system. The purpose of performance-based budgeting is to enhance and facilitate dialogue around accountability between government agencies and higher education institutions. In Egypt, more than three years ago, the Ministry of Finance launched an ambitious program intending to build the capacities of government

workers specialized in preparing and implementing a new concept called “programs and performance-based budgeting” (PPBB). Today, 80% of state agencies and 69% of monetary authorities have adopted PPBB in their budget planning for the current fiscal year. The Minister of Finance, Advisor to the Minister of Finance & Head of the Programs, and Performance Unit; said that during the last period, the ministry succeeded in implementing the "capacity building" program for workers specialized in the PPBB and linking the sustainable development goals with the programs of the Egypt 2030 vision and the government's work program 2018-2022 [10].

Public financial performance refers to the measure of government-level performance and how to measure and assess whether macroeconomic objectives have been achieved and whether public finances can be considered healthy on a macroeconomic level [11]. Numerous studies illuminate the factors influencing financial performance in both business and technology sectors. Additionally, public sector debt management distinguishes itself from that of private entities due to various factors. Local governments often can generate revenue through taxation, can access additional financing from central governments during times of distress, and fulfill a redistributive role in economic management [12]. According to recent statements by many international organizations, the rapid increase in government debt is one of the main problems in the global economic crisis, which the novel coronavirus has exacerbated, and another pandemic [13]. International organizations also referred, by the way, to improve the performance of public finances through the Public Expenditure and Financial Accountability model, which focuses on forecasting and control practices that predict payment obligations to public sector entities arising from loan contracts. According to previous research on public financial management

(Navarro-Galera et al., 2020), public organizations suggest that loan risk is a significant aspect of public debt and should be carefully analyzed and predicted to avoid another international bank debt crisis like the 2008 crisis.

Despite The evolution of the financial services reform being closely associated with progress in several frontier technologies, including some critical software-oriented technologies such as blockchain, data analytics, and AI, there are limitations to financial performance measurement. According to [14], The articles on financial evaluation highlight several limitations and constraints with financial indicators that relate to the incompleteness of purely financial information, its reliability, its comparability in a different context, and the impact of external factors. Hence, this paper aims to investigate Data Science and AI technologies for financial forecasting and prediction. Our study will highlight the significant advancements in the field and provide a pathway for prospective researchers who wish to develop forecasting and prediction models for local financial management. Financial forecasting consumes a sizable portion of computational intelligence for finance research. However, we chose to focus on those studies in a separate survey paper to other, less-covered application areas.

Meanwhile, we decided to include related studies with Data science-based trading strategies, which may have an embedded forecasting and prediction component. At last, we will propose a data-driven approach that adds value to financial decisions by enhancing financial distress detection systems. For our search methodology, we will survey and carefully review the studies that came to our attention from the following sources: (ScienceDirect, Google Scholar, and ResearchGate) to search for recent articles in Data Science and AI applications in finance.

This paper is organized as follows: Section 2 examines the related works. The comparative analysis of Almost techniques in the literature will be given in Section 3. The procedure for proposing a smart, data-driven financial system will be presented in Section 4. The paper's conclusion and potential future research directions will be provided in Section 5

2 Related Work

Since the global financial crisis, many researchers have sought to determine the effects of financial pressures on economic activity. It was mentioned by [15] that among these pressures is corporate bankruptcy, which is one of the main drivers of credit risk and receives immediate attention from creditors and investors. However, the financial damage caused by corporate bankruptcy cannot be accurately determined. For these reasons, researchers are looking for more effective forecasting models to predict bankruptcy and financial distress. Studies in predicting bankruptcy routinely adopt measures, including algorithmic trading, credit scoring, information, and accounting data from company financial statements to predict bankruptcy. According to [16], prediction is an essential yet challenging part of time series data analysis. Financial series analysis has long been a leading financial engineering and enterprise risk management area. Other industry-dependent factors such as seasonality, economic shocks, and unexpected events produce the data that affect the forecast, and statistical tools or techniques that reveal rules and predict future phenomena through financial time-serious analysis that have a guiding signature of both governments and corporations to forecast revenues, and costs to avoid known financial risks [17]. The ongoing advancement of data science, big data, artificial intelligence technologies, and financial knowledge models has simplified the realization of

complex financial models, as well as analysis and forecasting methods. According to [18], key aspects of applying financial time series models include data decomposition, denoising, and effectively addressing non-linear data patterns. Traditional time series analysis models, such as the Auto-Regressive Integrated Moving Average (ARIMA), dynamic models like Generalized Auto-Regressive Conditional Heteroskedasticity (GARCH), and machine learning models, such as Artificial Neural Networks (ANN), are not sufficient on their own to tackle these challenges. Numerous studies have explored hybrid model methodologies to analyze data, enhancing the likelihood of capturing both linear and non-linear patterns and ultimately improving forecasting performance.

In summary, the hybrid models mentioned above have been certified to synthesize the information in financial time series parameters, reveal the rules among data, and generate more accurate predictions. Hence, this study proposed a hybrid financial time series forecasting model combining data preprocessing techniques, Empirical Wavelet Transform (EWT), machine learning model Extreme Learning Machine (ELM), linear model ARIMA, and improved ABC algorithms. This assignment has explained the central importance of hybrid model methodology in financial time series analysis.

One of the important research projects of text mining [19] Indicated that the News had been an essential source for many financial time series predictions based on fundamental analysis. Digesting a vast amount of news and published data available on the Internet to forecast market trends can be a challenging task. To address this, a new domain-specific topic model known as the FinLDA model was introduced. This model integrates changes in financial time series with the traditional Latent Dirichlet Allocation (LDA) to generate a fresh set of latent topics relevant to time series variations. The FinLDA model has

two variants: 1) discrete FinLDA (d-FinLDA), which employs input data categorized into a discrete set of values to capture movements, and 2) continuous FinLDA (c-FinLDA), which utilizes real numbers or actual differences. The developers regarded this model as a method for feature extraction in data mining. For the final results, they detailed a framework for applying the model to predict financial time series. During the modeling phase, Support Vector Regression (SVR) and Multi-Layer Perceptron (MLP) algorithms were used to assess the advantages of these features by comparing outcomes based on four different sets of input features: combinations derived from LDA, d-FinLDA, c-FinLDA, and data from the S&P 500. The experiments for both variants, including those with discrete input data and those utilizing continuous variables, were conducted using news articles from Reuters in conjunction with Standard & Poor's 500 Index data. The outputs from the two variants served as input features for two conventional machine learning algorithms, namely SVR and Back Propagation Neural Network (BPNN), to validate the benefits of the features extracted from FinLDA in comparison to other features.

Another work is related to the text mining technique by [20]. They refer to financial fraud activities such as credit card fraud and money laundering, which have gradually increased. These activities result in the loss of both personal and business property, posing an even greater risk to national security, as the profits from fraud may be funneled into terrorism. Therefore, accurate detection of financial fraud and effective tracing of fraudulent activities are both essential and urgent. In addressing this issue, a novel deep-learning approach for predicting bankruptcy has been proposed, which evaluates the predictive power of textual data. The researchers constructed a comprehensive database comprising 11,827 publicly listed U.S. companies spanning from 1994 to 2014. This database includes

numerical variables derived from accounting and stock market data. Additionally, they extracted the qualitative section known as the Management Discussion and Analysis (MD&A) from the companies' annual filings, matching it to their notes. They explored various model configurations while incorporating different types of data. The findings indicate that a straightforward deep learning model utilizing the average embedding layer outperforms other data mining models that leverage textual information.

[21] proposed A data mining approach that utilizes a Backpropagation neural network. This method was applied in financial risk management to develop large-scale non-linear parallel optimization models by training, validating, and testing a dataset collected from a prominent commercial bank offering IoT-based services in China. By analyzing both on-balance and off-balance sheet items using Apache Spark and Hadoop HDFS, the findings indicate that this parallel risk management (PRM) model achieves rapid convergence and possesses robust predictive capabilities, effectively identifying default behaviors. Additionally, a distributed implementation across large data clusters significantly reduces the processing time associated with model training, validation, and testing.

[22] investigated the performance of deep learning algorithms, specifically RNN, LSTM, and GRU, in predicting financial distress among Malaysian public listed corporations using time-series data. The research compares the efficacy of various models, including LR, NN, SVM, DT, RNN, LSTM, and GRU, based on data collected over the year leading up to a corporation's designation as either PN17 or non-PN17. The dataset comprises the financial profiles of corporations listed on Bursa Malaysia, categorized into PN17 status, representing the worst-case scenario, and non-PN17, reflecting the best-case scenario, from 2011 to 2017. This study aims to enhance the

understanding of financial distress prediction for publicly listed Malaysian companies. By employing a deep learning approach, it seeks to aid multiple stakeholders in generating more accurate credit risk assessments.

According to [23], previous research uses econometric models (such as OLS/GLM/Probit/Logit), but there is now a consensus that these tools are intrinsically not predictive. Hence, they used a predictive machine learning method to analyze the predictability of the bankruptcy of 7795 Italian municipalities in the period 2009-2016. In detail, they adopt Gradient Enhancement Machines (GBM) to predict local government bankruptcy using a large set of administrative data. GBMs build a set of shallow, weak cascade trees, with each tree learning and improving from the previous one Combined. These weak cascade trees result in a strong "committee" that is often difficult to overcome with other algorithms. Recently, different tree reinforcement variables have been shown experimentally to be competitive modalities for structured tasks as hypothetical predictions [24]. In addition, they used Lasso, Random Forest, and Neural Network to validate our experimental analysis. Their results suggest that it is possible to make out-of-sample predictions with a high actual positive rate and a low false positive rate. In particular, the final model performs 117 times better than the unpredictable baseline level.

According to [25], Certain local governments often overlook relevant regulations when managing debt funds. This paper utilizes the analytical hierarchy process alongside the entropy method for mass weighting, ensuring that the determination of indicator weights is both objective and reasonable. In combination with the TOPSIS method, a comprehensive risk assessment model has been developed to facilitate objective evaluations. The assessment results accurately assess the level of debt risk through decision trees. Consequently, a

classification and regression tree has been constructed using recursive hashing based on a greedy algorithm, comprising two phases: tree creation and pruning. The decision tree can be categorized into two distinct methods based on different segmentation approaches: the information theory method represented by the C5.0 algorithm, and the lowest Gini index method known as the CART method. Both C5.0 and CART effectively tackle classification challenges with high efficiency, user-friendliness, and strong durability. Drawing on machine learning principles, this paper also explores both internal and external factors contributing to the implicit debt risks faced by local governments. It integrates the analytical hierarchy process, the entropy method, and the BP neural network method to create a risk assessment index. This index includes explicit debt risks, potential implicit debt risks, financial operational risks, and economic factors. Findings indicate that the simulation results from the established debt risk assessment system are promising, underscoring its policy significance in providing timely and objective insights into the local government debt risk landscape and identifying risk aggregation points across various debt types.

[26] expounded on the current state of research and the significance of financial risk early warning. They clarify the K-means clustering algorithm's historical development, current status, and future challenges. They also proposed a K-means clustering-based financial risk indicator system, preferred indicators, and represented the data, classified financial risk types, and optimized financial risk control. Finally, they carried out empirical experiments and the results from the analysis. According to the study findings, the K-means clustering method can effectively avoid the negative dynamic influence influenced by artificial division thresholds, continuously optimize the financial risk prediction process, and redistribute the target

dataset to each cluster center to obtain the optimized solution. As a result, the algorithm can distinguish the state intervals of various financial risks accurately and objectively, determine risk occurrence possibility and severity, and provide a scientific basis for risk prevention and management. The findings of this paper are a starting point for future research on financial risk early warning using the K-means clustering algorithm.

[27] indicated that Traditional prediction algorithms disregard the acquisition of fiscal redundancy and equity capital time series, in addition to challenges of spurious regression and error series correlation, resulting in suboptimal prediction accuracy. They solved the problem by developing a new data-driven macroeconomic growth prediction algorithm. They investigated the sequence of economic characteristics, reorganized the spatial structure of economic characteristics, and integrated economic data statistical information. The association rules between macroeconomic data were generated by optimizing the Apriori algorithm. The experimental results show that the proposed algorithm has excellent application adaptability, and the economic growth prediction results are accurate, indicating that the algorithm has high accuracy and can provide a solid foundation for macroeconomic change trends.

[28] discussed Data mining technology can uncover valuable knowledge and information hidden in large amounts of data; additionally, artificial intelligence technology is used for complex problem-solving and reasoning ability by simulating specialist knowledge and logic; and these new techniques for financial analysis, accounting information systems, and financial intelligence provide powerful technical support. He proposed a new architecture for an intelligent financial management support system based on the clustering algorithm, decision tree technique, and association rule mining technology

to provide an intelligent human-computer interaction information system that is useful to management and decision-makers. The proposed method was compared to the BP neural network and multiple linear regression (MLR) to validate the performance of the optimized fuzzy model. This paper's data comes from the Library's CSMAR, which is based on the Company's most accurate database and covers data on the stock market, bond market, fund market, and foreign exchange market. From 1 May 2010 to 9 May 2011, thirty-six publicly traded companies were randomly chosen from the database to extract data. They found its deficiencies through the analysis and summary of the intelligent data mining algorithm. They proposed an improved algorithm aimed at addressing the algorithm's shortcomings and the improved algorithm on the mining experiment, and the results show that it has certain advantages.

[29] As economic globalization progresses, competition between enterprises intensifies, the economy becomes saturated, and the risks to enterprises' survival and development increase. An enterprise needs to be more prudent in internalizing financial risks to avoid an avalanche of financial crises. In many cases, the internal financial situation has led to a company's downfall. As a result, early warning analysis, alerting, and control of the fiscal situation have become critical components of many companies' financial management. There are numerous approaches and models for conducting early financial warnings. The random forest method was used in this article to rank the importance of some financial indicators based on screened financial data from Chinese listed companies.
Furthermore, based on the importance of financial indicators, the paper used the CART algorithm to examine the factors influencing the generation of economic crises in Chinese listed companies. Based on the internal financial warning rule

construction results, the paper will be summarized and evaluated to obtain a reasonable and effective fiscal warning solution practically meaningful to the relevant stakeholders of the listed firms in China. The study results show that the method has an excellent predictive effect. At the same time, the technique provides the listed firms' management and Discrete Dynamics in Nature and Society.

Forecasting is the study of the future development and operation law of things using qualitative and quantitative methods such as mathematics, statistics, economics, computer, and engineering technology on the foundation of mastering pertinent information. However, the structure and parameters of the prediction network must, therefore, be able to be continuously changed throughout the prediction process. [30] proposed and built a local prediction model based on FNN (fuzzy neural network). The prediction results of the various components are then integrated to produce the final prediction result. The conventional financial time series model and other non-linear models are contrasted with the FNN-based financial time series prediction model. It is discovered that this paper's FNN-based financial time series prediction model performs as expected and offers some advantages over competing models.

3 A Comparative Analysis

In this section, we will review and compare various techniques employed in the financial domain.

Table 1. A Comparative Review of Recent Prediction Techniques

Author	Domain	Method	Results
[19]	Stock Market Prediction	SVR	Both BPNN and SVR Empirically Give Value Added to the Stock Market Prediction.
		MLP	
		BPNN	

[20]	Credit Card Fraud Money Laundering	CNN	Their Experimental Study Shows That a Simple Deep Learning Model Using Average Embedding Layer Outperforms Other Data Mining Models When Using Textual Information.
[21]	Financial Risk Prediction	BPNN	The parallel Risk Management (PRM) Model Has Fast Convergence and Powerful Predictive Capacity and Performs Efficiently in Screening Default Behaviors. At the Same Time, Distributed Implementation on Large Data Clusters Could Dramatically Reduce the Processing Time of Model Training, Validation, and Testing.
[22]	Financial Distress Prediction	RNN	By Applying the Deep Learning Approach, The Results Can Benefit Many Parties in Producing an Accurate Credit Risk Assessment
[23]	Financial Distress Prediction	Gradient Boosted Machine	Their Results Suggest That it is possible to Make Out-Of-Sample Predictions With a high True Positive Rate and a Low False Positive Rate. In Particular, The Final Model Performs 117 Times Better Than the Unpredictable Baseline Level.
Author	Domain	Method	Results
[25]	Debt Risks Prediction	C5.0 CART	The Simulation Effect of The Debt Risk Assessment System

		BP Neural Network	Established is Good. Its Policy Significance is in The Timely and Objective Reflection of The Local Government Debt Risk Situation and The Risk Aggregation Points of All Kinds of Debts.
[26]	Financial Risk Prediction	K-means Clustering Algorithm	The Algorithm Can Distinguish the State Interval of Different Financial Risks Accurately and Objectively, Determine Risk Occurrence Possibility and Severity, and Provide A Scientific Basis For Risk management and Prevention.
[27]	Economic Growth Prediction	A priori Algorithm	The experimental findings indicate that the proposed algorithm has desirable application adaptability, and the economic growth prediction results match the actual situation, demonstrating that the algorithm has highly accurate and can provide a reliable basis for macroeconomic change trends.
[28]	Stock Market	BP Neural Network	Its Deficiencies and Present the Improved Algorithm, Aiming at The Algorithm's Shortcomings and The Optimized Algorithm on the Mining Experiment, and Experiment Results Demonstrate That it Has Certain Advantages
	Foreign Exchange Market	Multiple Linear Regression	
[29]	Financial Crises Prediction	Random Forest Method	The Study's Results show that the method Has an impressive Predictive Effect. At The

		CART Algorithm	Same Time, The Method Can Provide the Listed Companies' Management and Discrete Dynamics in Nature and Society
[30]	Financial Time Series	Fuzzy Neural Network	The Findings Demonstrate That the Algorithm is Capable of Achieving High Classification Accuracy.

3.1 Discussion and Analysis

According to [31], With the increasing use of AI technology, many AI-based applications have been developed and deployed in various fields, such as finance, healthcare, resource management, and industry. Also, related studies provided a high-level overview of data science and AI technologies today in economics and finance. Based on the comparative analysis presented in Table (1), most articles review data science and AI's application and the current situation in the financial domain. It introduced the broad application of data science and AI in the financial field from five aspects: the discovery and prediction of false financial reports, the discovery and prediction of financial distress, the discovery and prediction of economic growth, the prediction of credit card fraud and money laundering, and the prediction of the stock market price. In addition, some advantages and issues related to AI-based applications will be introduced.

A. Benefits.

[31] investigated the use of data science techniques in the fields of economics and finance through fundamental technical challenges such as data processing, data protection, modeling, integration, and interpretation by employing Data science that can enhance economic forecasting models through:

- Enhancing and complementing official leading statistical indicators with new unstructured big data sources in real-time.
- Assessing current and future economic and financial conditions by considering complex non-linear relationships among forecasters.
- Optimizing the returns of algorithmic trading and completely data-driven tasks.
- Offering robust support for decision-making by ensuring that the outputs of machine learning algorithms are comprehensible.

Also, [32] indicated that Artificial intelligence (AI) is one of the critical topics of recent times because it has disrupted most industries in recent years, and the financial services sector is no exception. Furthermore,

- AI techniques can significantly lower transaction costs by automatically analyzing market conditions to identify the optimal time, size, and location for transactions.
- AI has far-reaching implications for portfolio risk management.
- Evolving AI methods can provide risk managers with enhanced tools for monitoring and assessing risks. Specifically, AI aids in the validation and back-testing of risk models. Moreover, AI systems are capable of efficiently extracting information from various structured and unstructured data sources, leading to more accurate forecasts of bankruptcy and credit risk, as well as better insights into market volatility, macroeconomic trends, and financial crises.

B. Issues

An increasing number of countries are actively engaging in the AI financial market. Currently, some developed nations lead the

way in this sphere, while many emerging economies are still in the early stages of exploration and learning. Additionally, there are four potential financial risks associated with AI on a global scale, which necessitate thoughtful policy recommendations.[33].

- The widespread adoption of AI has posed substantial challenges in the management and utilization of financial data across various countries. Practical insights from supervisory experiences in multiple regions indicate that many nations have established ethical standards governing the development and application of AI before advancing these technologies. In terms of preventing financial risk, there is a significant concern that numerous participants in the financial markets may concurrently engage in automated trading using AI technology, which could markedly heighten the likelihood of economic crises and instability.
- The extensive use of AI may create turmoil in areas of ethics, morality, law, and accountability. Consequently, the implementation of AI in the financial sector requires a robust legal framework and ethical standards to clearly define the rights, obligations, and responsibilities of all involved parties.
- It is essential to prioritize personal security as a key measure of national and social civilization, one that transcends the advances of science and technology. While AI can gather extensive data and conduct diverse analyses, the accumulation of this data inevitably heightens the risk of personal privacy breaches. Therefore, it is imperative to establish robust mechanisms for safeguarding consumer privacy and data security. Additionally, reviewing AI data privacy settings is of paramount importance.
- Fourth, it is essential to foster international cooperation in AI security. On one hand, the global community must unite to combat the moral hazards associated with AI technology and

work to counteract unlawful global trends to ensure the safe and healthy development of AI. On the other hand, the international financial community should actively collaborate to share new scientific and technological advancements, establishing and enhancing the financial market for AI. This way, the societal benefits generated by AI in finance can ultimately serve humanity positively.

[33] also discussed several possible issues of using AI in asset management.

- AI models often exhibit a level of opacity and complexity that makes it challenging for managers to monitor and evaluate them effectively. Their dependence on sensitive data can introduce substantial risk.
- Additionally, these models may be inadequately trained if the data used is of poor quality or insufficient quantity.
- Insufficient human oversight can result in frequent errors, an inability to detect inference mistakes, and misconceptions among investors regarding investment practices and yield attribution.
- Ultimately, it remains uncertain whether the advantages of AI can outweigh the considerable costs associated with its development and implementation.

4 A Proposed Approach

According to the [34], Next-generation IFMIS solutions integrate public financial management (PFM) operational systems for online transaction processing (OLTP) with robust data warehousing (DW) capabilities for distributed online analytical processing (OLAP). This combination aids in effective forecasting, planning, performance monitoring, and decision support.

Nevertheless, according to [35], Long-term trends such as aging populations, rising inequality, climate change, and unpredictable challenges like migration and security significantly impact citizens' well-being and resilience. This situation compels governments to craft a long-term vision, make evidence-based investments, and coordinate their efforts effectively. There is a growing recognition among governments of the value of better data utilization in addressing these challenges while also enhancing policy productivity, performance, and inclusivity. A Data-Driven Public Sector (DDPS) revolutionizes the design, delivery, and monitoring of public policies and services through effective data management, sharing, and application. Treating data as a strategic asset is essential for governments to enhance public sector intelligence, thereby improving their ability to develop long-term policies and services that are both inclusive and trustworthy.

We recommend enhancing the analytical process within FMIS by utilizing smart data-driven systems, as illustrated in Figure 2. Smart data-driven solutions serve as software tools for managing information and data. Their two primary functions are the acquisition and presentation of information. Information acquisition typically occurs through data entry forms or by connecting with external data sources. Conversely, information presentation involves retrieving and displaying stored data to users, complete with suitable navigation and querying capabilities. These data-driven systems also necessitate significant user interaction for both acquiring and retrieving information. Undoubtedly, data is one of the most prevalent types of customized software systems in use today. Examples of data-driven applications include university registration systems, e-commerce platforms, content management systems, and financial and accounting software.

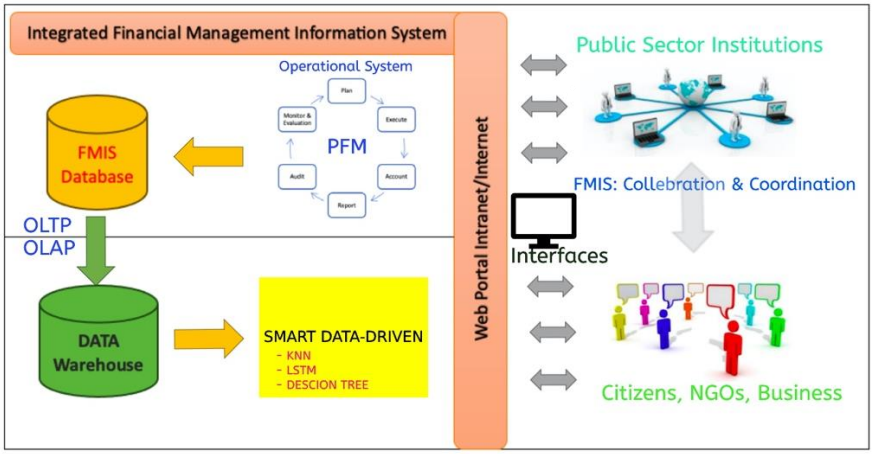

Fig. 1. Developed FMIS solutions combining AI-Based Approach

5 Conclusion

In the case of developing countries, despite adherence to the directives of international organizations in the context of economic reform, there are still challenges and difficulties on financial management, especially in forecasting financial risks. In this research, we presented many proposals that can be applied in the field of public finance to improve the efficiency and effectiveness of financial management and improve financial decisions related to budgeted expenditures and revenues. However, cloud solutions, artificial intelligence, internet technologies, automated machine learning, and other digital economy technologies are making a huge impact. And we found that the results of most of these studies have confirmed that the use of smart technologies may help financial management in financial forecasting accurately. In the context of the future study, we will apply one of the techniques to the most important budget items of the accounting units of the Ministry of Electricity and Energy, which are greatly affected by economic changes such as (fuel price, foreign currency exchange rate, etc.).

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