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THE USE OF ARTIFICIAL INTELLIGENCE TO IMPROVE PUBLIC FINANCE ACCOUNTING

The financial sector, as we know, is the driving force of the global economy. Along with the digital boom in the 21st century, this sector has also undergone drastic changes. What we had to work with in the last century is now becoming impossible for the digital generation.

Artificial intelligence (AI) has revolutionized all industries, and the field of finance and accounting is no exception. Thanks to advances in machine learning, data analysis and automation, artificial intelligence is ready to change the way financial transactions are conducted. From optimizing decision-making processes to rationalizing everyday tasks, the future of AI in finance and accounting is both promising and transformational.

Contemporary digital technologies leveraging artificial intelligence and big data exert a substantial influence across various facets of socio-economic life. Despite this, the realm of public finance management remains relatively untouched by digitalization. Nevertheless, this domain holds immense potential for the integration of big data and artificial intelligence, given its reliance on vast quantities of data, including unstructured information. Surprisingly, there exists scant exploration within scientific literature regarding the processes, mechanisms, and ramifications of digital technologies on public finance management.

The primary objective of this article is to anticipate the potential shifts within the public finance management system over the medium and long term, precipitated by the adoption of digital technologies.

Keywords: accounting, public finance, artificial intelligence, digital technologies, budget process, budget execution, public procurement.

Introduction

The technological arsenal of artificial intelligence is already impressive today. With some simplification, it can be divided into five large groups: machine learning, natural language processing, machine vision algorithms, software agents, or bots, and, finally, robotics. The use of these technologies, which until recently passed through the category of science fiction, is already effective now. AI makes decisions faster, does it more accurately and is cheaper than a human. It is not for nothing that more than half of national companies have already allocated budgets for the implementation of solutions based on in-depth analytics [1].

According to a study by the McKinsey Global Institute (MGI), the financial sector, along with telecommunications and high–tech, is the most promising platform for the introduction of AI. The reason is a significant economic effect in working with clients, risk management, and efficiency improvement. AI is rapidly advancing within the financial sector, where it is already being utilized to develop products for cross-selling and upselling, optimize pricing strategies, diminish customer attrition, employ voice or facial recognition for user identification, assess credit risks, detect fraudulent activities, and forecast demand trends.

When implementing AI, companies often remember only the technological aspects of the project. Our vulnerabilities stem from unresolved processes within the organization, notably the absence of a robust system for verifying models or retraining existing ones. Furthermore, the cultural aspect poses a challenge, as the readiness of the company's staff to embrace new methodologies, such as the test-and-learn approach, often presents an insurmountable hurdle. A proven strategy, as demonstrated by successful implementations, involves initiating several small-scale model projects prior to the comprehensive rollout of the program. This reduces the fear of failure among management, and distrust of new tools among staff.

The rapid advancement of artificial intelligence and neurotechnologies has sparked a growing demand for them across government and business sectors. This surge in demand is exemplified by the explosive growth of venture investments in fintech startups leveraging AI. The term «FinTech» encompasses technology-driven financial innovations that introduce new business models, applications, processes, or products, thereby significantly impacting financial markets, institutions, and the provision of financial services [2].

Numerous works delve into the transformative potential of AI technology on the financial sector. For instance, researchers at Deutsche Bank explore the evolution of traditional banking systems into digital ecosystems influenced by emerging technologies [3]. Various business models of fintech projects are examined in [4; 5]. The Article delves into trends shaping the global fintech market

[6]. Furthermore, risk management within the fintech sector is scrutinized in [2], with an emphasis on the imperative of mitigating potential negative impacts on consumers and investors for sustainable project development. Additionally, [7] highlights that while fintech startups introduce innovative payment solutions, they may not always align with the stability needs of the financial sector, potentially impacting the infrastructure stability of financial systems.

Materials and methods

For forecasting purposes, a methodological approach grounded in extrapolation was employed. The pervasive influence of digital technologies on various sectors of socio-economic activities has prompted the extrapolation of their forms and mechanisms to the public finance management system, particularly across different stages of the budget process.

Results and discussion

Modern digital technologies hold the potential to significantly enhance the efficacy of public finance management. It's noteworthy that the budgetary system is inherently conducive to the integration of digital technologies and artificial intelligence. Budgets, fundamentally, rely on basic arithmetic operations, yet they entail vast volumes of data. Currently, data processing is fragmented across numerous isolated segments, each managed by different individuals and departments. Only automated systems leveraging artificial intelligence principles can seamlessly consolidate these disparate blocks of information.

The use of AI-based solutions for data and document processing increases the efficiency of processes, as well as allows you to extract useful information. Data analytics, mining, and natural language processing are examples of AI and ML solutions that help companies obtain important information. We have already discussed in part the role of chatbots in document verification above, but there are other functions:

– chatbot algorithms will easily collect employee documents;

– chatbots help lenders and their clients collect, store and verify all necessary information;

– chatbots are advanced enough to recognize files of various formats. AI selects information from many sources and forms it into a single document that is convenient for human perception;

– analyze and study documents, then classify them into various categories and in case of absence or inconsistency of important data, the application is automatically transferred to responsible persons;

– notify the client of the completion of the application process if the submitted documents meet the requirements of the lender. In other cases, chatbots for loans notify the banking institution that the application should be rechecked.

The main factors determining the need for the use of artificial intelligence in financial accounting can be presented as follows.

Table 1 – Factors determining the need for the use of AI in accounting

№	Opportunity	Action	Result
1	Automation and efficiency	Automation based on artificial intelligence is designed to eliminate repetitive and time-consuming tasks in the financial and accounting sectors. Algorithms can handle data entry, reconciliation, and reporting, freeing up human resources for more strategic and analytical work.	This increase in efficiency allows specialists to focus on more important activities that require critical thinking and creative approach.
2	Advanced data analysis	The huge volume of financial data generated requires sophisticated analysis tools. Artificial intelligence-based algorithms can quickly process huge datasets, identify patterns, and extract useful information.	This predictive analysis can help identify fraud, optimize investment strategies, and identify potential risks, leading to more informed decisions.
3	Personalized customer experience	In the field of finance, customer satisfaction is of paramount importance. Artificial intelligence algorithms can analyze customer data to offer personalized financial advice and services.	Chatbots equipped with natural language processing capabilities can interact with customers, respond to requests and provide financial recommendations 24/7, increasing customer engagement and loyalty.
4	Risk management and fraud detection	And It does an excellent job of identifying irregularities and anomalies in financial data. Machine learning algorithms can detect unusual patterns in transactions, helping institutions identify potential fraud in real time.	This proactive approach enhances security measures and reduces financial losses due to fraudulent activities.

5	Algorithmic trading	AI has already begun to play a significant role in algorithmic trading, where computers make high-frequency trades based on predefined criteria.	Advanced artificial intelligence models can analyze market trends, news sentiment, and historical data to make trading decisions in a split second, potentially surpassing human traders.
6	Compliance with regulatory requirements	Complying with ever-changing financial regulations can be a daunting task. Artificial intelligence can help monitor transactions and data for compliance, flagging potential violations and minimizing the risk of non-compliance.	This reduces the burden on financial institutions to keep abreast of complex changes in legislation.
7	Data security and confidentiality	AI can enhance cybersecurity efforts by constantly monitoring and analyzing network traffic for potential threats.	Artificial intelligence-based encryption methods can improve data protection and ensure the confidentiality of confidential financial information.
Note: compiled by the authors			

Accordingly, the future of artificial intelligence in finance and accounting will revolutionize these industries by increasing efficiency, accuracy and decision-making capabilities. As it continues to evolve, it will allow professionals to focus on strategic initiatives by delegating routine tasks to automated systems. However, this transformation also raises questions about the retraining of the workforce, ethical considerations, and the balance between human and machine decision-making. Responsible and thoughtful use will be the key to making full use of its potential in the financial and accounting sectors.

The budget system grapples with numerous challenges that traditional methods alone cannot adequately address, necessitating the widespread adoption of digital technologies and artificial intelligence. These challenges persist across all stages of the budget process. During the planning phase, many public

entities encounter difficulty in aligning the budget structure with citizens' needs. Calculating these needs is intricate due to the plethora of information involved, requiring the utilization of artificial intelligence tools for processing. In the execution phase of the budget, the most significant challenges arise within the public procurement system.

Many problems of public finance management are caused by insufficient attention to budget data and ensuring their openness.

The audit of the consolidated financial statements of the republican budget by the Supreme Audit Chamber (KFO RB) has been conducted since 2020. Based on the results of the audits conducted in relation to the KFO RB for 2020 and 2021, an opinion was expressed with a reservation. The KFO RB for 2022 was compiled on the basis of reporting data from 37 administrators of republican budget programs and financial statements on receipts. The currency of the consolidated balance sheet as of January 1, 2023 amounted to 23,839.1 billion tenge, for 2022 the total revenues of the republican budget amounted to 21,672.6 billion tenge, total expenses – 22,723.5 billion tenge (according to the accrual method).

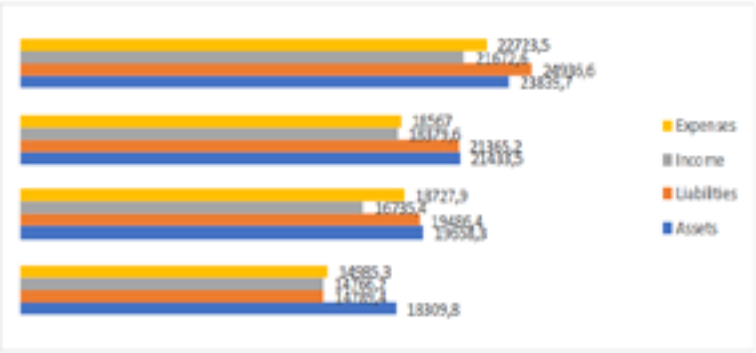

Figure 1 – Dynamics of structural elements of the KFO RB, billion tenge

Since the compilation of the first KFO RB, there has been a significant improvement in its quality and reliability. In total, taking into account the recommendations of the VAP, the Ministry of Finance provided recognition and reliable reflection of assets in the amount of 5,645.2 billion tenge, liabilities in the amount of 295.2 billion tenge. The main purpose of the KFO RB is an objective and reliable representation of assets, liabilities, revenues and expenditures of the state at the national level. In turn, the KFO RB for 2022 still does not ensure the achievement of this goal, since a number of its key elements are reflected

biased. Thus, according to the data of the KFO RB, by the end of 2022, a negative accumulated financial result in the amount of 1,112 billion tenge and a negative value of the net assets of the republican budget in the amount of 1,097.4 billion tenge were recorded (for the first time since the compilation of the KFO RB, liabilities exceed assets).

Table 2 – Dynamics of the main indicators of the KFO RB, billion tenge

Indicators	01.01.2020	01.01.2021	01.01.2022	01.01.2023
Net assets	3519,2	171,9	68,6	-1097,4
Financial result	3519,2	160,4	57,5	-1112
Long-term liabilities	12 392,9	15 876,7	17 480,6	19 593,5
Balance sheet currency	18 308,6	19 658,3	21 433,8	23 839,1
The coefficient of financial stability*	0,869	0,816	0,819	0,776

According to the Ministry of Finance, there is a tendency for the financial situation of the state to deteriorate significantly at the national level. According to the estimates of the Supreme Audit Chamber, this situation is mainly due to conceptual shortcomings in the methodology for compiling the KFO RB.

Taking into account the above, as well as the fact that the KFO RB for 2022 does not give an objective idea of the financial situation of the state and the results of its activities at the national level, the Supreme Audit Chamber expressed an opinion with a reservation regarding it. In order to eliminate the noted negative aspects, the Ministry of Finance provides for a phased transition to IFRS within the framework of the Concept of Public Finance Management, which in the future will ensure the objectivity of the KFO RB.

The budget law is a coordinated work of hundreds of people and dozens of departments and departments, which, in addition, must speak «the same language» In this sense, a single digital system with a large amount of memory and capable of processing a huge amount of information at once looks more reliable. The document file containing the text of the law and all numerical indicators has a size of 828 kb, which is an extremely simple task for modern processors. The machine will be able to read the file and extract all the numbers into the desired form in less than 1 minute, a person cannot physically read and write out information from 991 pages of the document with such accuracy. The simplest USB drive can store 32 GB (32,000,000 kb) of information, which is about 37 thousand copies of the budget law. A person will not be able to save and accurately reproduce such a volume of information. This huge difference in the possibilities of storing and processing information rightly raises the question of the importance of applying the

technological progress achieved in everyday routine operations, which a specialist rarely copes with 100 % [8]. It is worth identifying those areas in planning that will help strengthen machine intelligence.

Table 3 – The main directions of strengthening financial planning

	Tasks	Impact on processes
Analysis	Scenario analysis; Analysis of deviations	Predictive analytics; Prescriptive analytics; Sentiment Analysis; Value Drivers
Forecast	Uploading data; Forecast; Analysis of variations	Predictive analytics; Prescriptive analytics
Planning	Scenarios; Simulation and analysis of deviations	Predictive analytics; Prescriptive analytics
Reporting	Uploading data; Combining data; Commenting	Machine learning; Robotic processes; Predictive analytics

The extensive adoption of accounting software in contemporary times facilitates the accumulation of substantial data, allowing for the recording of all financial and business transactions, including those involving even the smallest recipients of budgetary funds. Consequently, financial management entities are endowed with an abundance of data, sufficient for constructing an analytical system. Notably, it's imperative to underscore the importance of predictive and prescriptive analytics, as they serve as potent tools to aid decision-making and provide managerial support during the planning stage.

While descriptive analytics worked using correlations, clusters, and trends, predictive analytics uses regression analysis and time series models. This means that you can answer, for example, the question of when a certain result can be achieved. The highest level of analytics, prescriptive analytics, uses optimization models. Here, with the help of decision-making models, an attempt is made to explain to the financial authority what needs to be implemented in order to achieve a certain financial result [9].

The proposed stages of the implementation of artificial intelligence technology in financial planning are data collection according to certain rules. In order to train an artificial neural network, it is necessary to have an understandable data set in which the machine can find correlations and build a model. Then it is worth using such datasets in machine learning. Machine learning is not artificial intelligence, it

is algorithms that take into account mathematical dependencies between data and allow you to reproduce new data according to the studied law. As a result, at the final stage, an adaptive learning approach is introduced, where the system offers certain solutions to planning tasks with the participation of the person making the final decision. The main task is to ensure transparency of data and operations, which served as the basis for the conclusions of machine intelligence («inference») and the development of a particular budget project model.

Some of the main applications of artificial intelligence include discourse recognition (Figure 2), natural language processing (NLP), machine vision and expert systems, AI plays an important role in the computerized change of accounting and money [10].

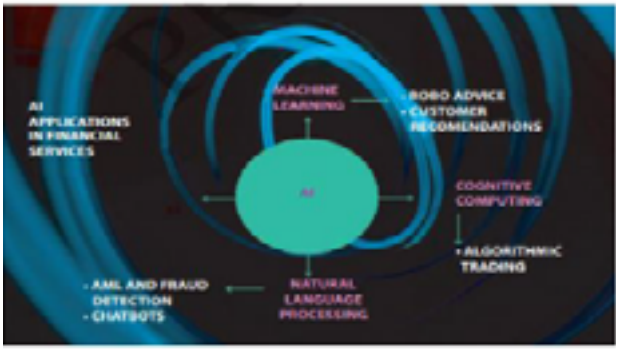

Figure 2 – Al Application of finance

The evolution in accounting and financial practices is profound, with AI-driven machines continuously learning and adapting to optimize accounting procedures for various transactions.

Figure 3 – Use of Al application of finance

The integration of digitization into the review process enhances security measures (Figure 3). With the aid of sophisticated tracking tools, reviewers can monitor each received record closely. Unlike traditional paper-based methods, digital documents streamline the verification process, making it more efficient. Consequently, digitization during verification stages promotes enhanced accuracy in checks. Moreover, leveraging computerized algorithms for accounting and verification enables comprehensive monitoring of every financial transaction within the organization, resulting in increased productivity and scalability under the oversight of artificial intelligence.

Conclusions

Thus, the considered approach to the integration of artificial intelligence into the management of public and local finances creates a foundation for research not only in the field of management and management, but also in the field of information technology. Increasing the productivity of the operational activities of public administration bodies significantly affects the increase in the efficiency and expediency of spending budget funds.

At the same time, consideration of only one stage of financial management – «planning» highlights a large layer of problems at the legislative and technological level. Significant investments are needed in the material and technical base, namely data processing centers of state executive authorities. At the legislative level, it is necessary to work out the standards, methods, restrictions and responsibilities of persons using the results of artificial intelligence to make managerial decisions. In Kazakhstan, the distance from the decision-making center is solved by the widespread digitalization of communication processes, document exchange, and information. Thus, it is worth considering the use of artificial intelligence systems

only in the complex of general measures for the development of information technologies in state and local authorities.

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МЕМЛЕКЕТТІК ҚАРЖЫ ЕСЕБІН ЖАҚСАРТУ ҮШІН ЖАСАНДЫ ИНТЕЛЛЕКТТІ ПАЙДАЛАНУ

Қаржы саласы, біз білетіндей, әлемдік экономиканың қозғаушы күші болып табылады. 21 ғасырдағы цифрлық серпіліспен бірге бұл сектор да түбегейлі өзгерістерге ұшырады. Өткен ғасырда жұмыс істеуге тура келген нәрсе қазір цифрлық ұрпақ үшін мүмкін емес болып отыр.

Жасанды интеллект (AI) барлық салаларда төңкеріс жасады және қаржы және бухгалтерлік есеп саласы да ерекшелік емес. Машиналық оқыту, деректерді талдау және автоматтандыру саласындағы жетістіктердің арқасында жасанды интеллект қаржылық операцияларды жүргізу тәсілін өзгертуге дайын. Шешім қабылдау процестерін оңтайландырудан бастап күнделікті міндеттерді рационализациялауға дейін қаржы мен бухгалтерлік есептегі AI болашағы перспективалы және трансформациялық болып табылады.

Жасанды интеллект пен үлкен деректерге негізделген заманауи цифрлық технологиялар қоғамның әлеуметтік-экономикалық өмірінің көптеген салаларына айтарлықтай әсер етеді. Қазіргі уақытта цифрландыру мемлекеттік қаржыны басқару жүйесіне аз дәрежеде әсер етті. Алайда, бұл сала үлкен деректер мен жасанды интеллектті пайдалану үшін жоғары әлеуетке ие, өйткені ол ақпараттың едәуір көлеміне, соның ішінде құрылымдалмаған ақпаратқа негізделген. Сонымен қатар, ғылыми әдебиеттерде цифрлық технологиялардың мемлекеттік қаржыны басқаруға әсер ету процесі, механизмі мен формалары аз зерттелген.

Осы баптың мақсаты цифрлық технологиялардың әсерінен болуы мүмкін мемлекеттік қаржыны басқару жүйесіндегі өзгерістерді орта және ұзақ мерзімді перспективада болжау болып табылады.

Кілт сөздер: есепке алу, мемлекеттік қаржы, жасанды интеллект, цифрлық технологиялар, бюджеттік процесс, бюджеттің атқарылуы, мемлекеттік сатып алу.

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ИСПОЛЬЗОВАНИЕ ИСКУССТВЕННОГО ИНТЕЛЛЕКТА ДЛЯ УЛУЧШЕНИЯ УЧЕТА ГОСУДАРСТВЕННЫХ ФИНАНСОВ

Финансовая сфера, как мы знаем, является движущей силой мировой экономики. Вместе с бумом цифровых технологий в 21 веке, этот сектор также претерпел кардинальные изменения. То, с чем приходилось работать в прошлом столетии, теперь становится невозможным для цифрового поколения.

Искусственный интеллект (ИИ) произвел революцию во всех отраслях, и область финансов и бухгалтерского учета не является исключением. Благодаря достижениям в области машинного обучения, анализа данных и автоматизации искусственный интеллект готов изменить способ проведения финансовых операций. От оптимизации процессов принятия решений до рационализации повседневных задач – будущее ИИ в финансах и бухгалтерском учете является одновременно многообещающим и трансформационным.

Современные цифровые технологии, опирающиеся на искусственный интеллект и большие данные, оказывают существенное воздействие на многие аспекты социально-экономической жизни общества. Однако система управления государственными финансами в настоящее время лишь в ограниченной степени подверглась цифровизации. Вместе с тем, именно в этой сфере заложен высокий потенциал для применения больших данных и искусственного интеллекта, поскольку она базируется на обширных объемах информации, включая неструктурированную. В то же время, в научной литературе недостаточно исследованы процессы,

механизмы и формы воздействия цифровых технологий на управление государственными финансами.

Цель данной статьи заключается в прогнозировании средне- и долгосрочных изменений в системе управления государственными финансами, которые могут произойти под воздействием цифровых технологий.

Ключевые слова: учет, государственные финансы, искусственный интеллект, цифровые технологии, бюджетный процесс, исполнение бюджета, государственные закупки.

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