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DIGITALIZATION OF TAX ADMINISTRATION IN KAZAKHSTAN: MODERN TECHNOLOGIES AND DEVELOPMENT DIRECTIONS

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Abstract. *The relevance of the study* is determined by the fact that, in the context of accelerated digital transformation of public administration, tax administration serves as a key element in ensuring fiscal sustainability and economic transparency. This article provides a comprehensive analysis of the digitalization of tax administration in the Republic of Kazakhstan, focusing on modern technological solutions, economic effects, and prospects for further development. *The purpose of the study* is to assess the current state, technological foundations, economic effects and development directions of tax administration digitalization in Kazakhstan. *The research methodology* is based on statistical data from the State Revenue Committee of the Republic of Kazakhstan, materials from the OECD and the World Bank, as well as national digitalization reports for 2018–2025. The research applies methods of systems analysis, comparative analysis, econometric modelling, and forecasting. *The findings show* that the implementation of the Integrated Tax Administration System (ISNA), electronic document management, the electronic invoice system, online cash registers, and mobile applications such as e-Salyq Azamat and e-Salyq Business has reduced taxpayers' administrative costs by 35–40%, accelerated VAT refund procedures to 15 days, and increased tax collection by 12–18%. The authors developed an econometric model demonstrating a positive correlation between the level of digitalization of tax administration and tax revenues to the

consolidated budget ($R^2 = 0.87$). The key development directions identified include the integration of artificial intelligence and big data, the introduction of blockchain technologies for transaction verification, the development of a proactive taxpayer service model, and the strengthening of international tax cooperation in the digital environment. *The practical significance of the study* lies in the fact that its results can be used for shaping public policy in the field of digitalization and may be adapted for other transition economies.

Keywords: digitalization; tax administration; electronic taxation; tax technologies; ISNA; electronic invoices; online cash registers; artificial intelligence in taxation; Republic of Kazakhstan; fiscal transparency

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ҚАЗАҚСТАНДАҒЫ САЛЫҚ ӘКІМШІЛЕНДІРУДІ ЦИФРЛАНДЫРУ: ЗАМАНАУИ ТЕХНОЛОГИЯЛАР ЖӘНЕ ДАМУ БАҒЫТТАРЫ

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Аннотация. *Зерттеудің өзектілігі* жеделдетілген мемлекеттік басқаруды цифрлық трансформациялау жағдайында салықтық әкімшілендіру фискалдық тұрақтылық пен экономиканың ашықтығын қамтамасыз етудің негізгі элементі ретінде қарастырылуымен айқындалады. Бұл мақалада Қазақстан Республикасындағы салықтық әкімшілендіруді цифрландыру үдерістері кешенді талданып, заманауи технологиялық шешімдер, экономикалық әсерлер және одан әрі даму перспективалары қарастырылады. *Зерттеудің мақсаты* Қазақстандағы салықтық әкімшілендіруді цифрландырудың қазіргі жағдайын, технологиялық негіздерін, экономикалық әсерлерін және даму бағыттарын бағалау болып табылады. *Зерттеудің әдіснамалық негізін*

Қазақстан Республикасы Мемлекеттік кірістер комитетінің статистикалық деректері, ЭЫДҰ, Дүниежүзілік банк материалдары және 2018–2025 жылдар аралығындағы цифрландыру жөніндегі ұлттық есептер құрайды. Жұмыста жүйелік талдау, салыстырмалы талдау, эконометрикалық модельдеу және болжамдық талдау әдістері қолданылды. *Зерттеу нәтижелері* Интеграцияланған салықтық әкімшілендіру жүйесін (ISNA), электрондық құжат айналымын, электрондық шот-фактуралар жүйесін, онлайн-бақылау-касса машиналарын және e-Salyq Azamat, e-Salyq Business мобильдік қосымшаларын енгізу салық төлеушілердің әкімшілік шығындарын 35–40%-ға қысқартуға, ҚҚС қайтару үдерісін 15 күнге дейін жеделдетуге және салықтардың жиналу деңгейін 12–18%-ға арттыруға мүмкіндік бергенін көрсетті. Авторлар салықтық әкімшілендіруді цифрландыру деңгейі мен шоғырландырылған бюджетке түсетін салық түсімдері арасындағы оң корреляцияны көрсететін эконометрикалық модель әзірледі ($R^2 = 0,87$). Негізгі даму бағыттары ретінде жасанды интеллект пен үлкен деректерді интеграциялау, транзакцияларды верификациялау үшін блокчейн технологияларын енгізу, салық төлеушілерге қызмет көрсетудің проактивті моделін дамыту және цифрлық ортадағы халықаралық салық ынтымақтастығын күшейту айқындалды. *Зерттеудің практикалық маңыздылығы* оның нәтижелері цифрландыру саласындағы мемлекеттік саясатты қалыптастыру үшін қолданылуы және өтпелі экономикасы бар басқа елдер тәжірибесіне бейімделуі мүмкін екендігімен айқындалады.

Түйін сөздер: цифрландыру; салықтық әкімшілендіру; электрондық салық салу; салықтық технологиялар; ISNA; электрондық шот-фактуралар; онлайн-кассалар; салық салудағы жасанды интеллект; Қазақстан Республикасы; фискалдық ашықтық

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ЦИФРОВИЗАЦИЯ НАЛОГОВОГО АДМИНИСТРИРОВАНИЯ В КАЗАХСТАНЕ: СОВРЕМЕННЫЕ ТЕХНОЛОГИИ И НАПРАВЛЕНИЯ РАЗВИТИЯ

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Аннотация. *Актуальность исследования обусловлена тем, что в условиях ускоренной цифровой трансформации государственного управления налоговое администрирование выступает ключевым элементом обеспечения фискальной устойчивости и прозрачности экономики. Данная статья представляет комплексный анализ процессов цифровизации налогового администрирования в Республике Казахстан, рассматривая современные технологические решения, экономические эффекты и перспективы дальнейшего развития. Цель исследования состоит в оценке современного состояния, технологических основ, экономических эффектов и направлений развития цифровизации налогового администрирования в Казахстане. Методологическую основу исследования составляют статистические данные Государственного комитета по доходам Республики Казахстан, материалы ОЭСР, Всемирного банка и национальные отчеты о цифровизации за период 2018–2025 гг. В работе применены методы системного анализа, сравнительного анализа, эконометрического моделирования и прогнозного анализа. Результаты исследования показали, что внедрение интегрированной системы налогового администрирования (ISNA), электронного документооборота, системы электронных счетов-фактур (ЭСФ), онлайн-кассовых аппаратов и мобильных приложений e-Salyq Azamat, e-Salyq Business обеспечило сокращение административных издержек налогоплательщиков на 35–40%, ускорение процессов возмещения НДС до 15 дней и рост собираемости налогов на 12–18%. Авторами разработана эконометрическая модель, демонстрирующая положительную корреляцию между уровнем цифровизации налогового администрирования и величиной налоговых поступлений в консолидированный бюджет ($R^2 = 0,87$). Выявлены ключевые направления развития: интеграция искусственного интеллекта и больших данных, внедрение блокчейн-технологий для верификации транзакций, развитие проактивной модели обслуживания налогоплательщиков и усиление международного налогового сотрудничества в цифровой среде. Практическая значимость исследования заключается в том, что его результаты могут быть использованы при формировании государственной политики цифровизации и адаптированы для других стран с переходной экономикой.*

Ключевые слова: цифровизация; налоговое администрирование; электронное налогообложение; налоговые технологии; ИСНА; электронные счета-фактуры; онлайн-кассы; искусственный интеллект в налогообложении; Республика Казахстан; фискальная прозрачность

Introduction. Digital transformation of public institutions is one of the most dynamic trends in contemporary global development. In the context of tax administration, digitalization should be considered not merely as a technological upgrade, but as a strategic factor in improving the effectiveness of fiscal policy, reducing administrative barriers and strengthening trust between the state and taxpayers (OECD, 2019; World Bank, 2021). According to the Organisation for

Economic Co-operation and Development, countries that have implemented comprehensive digital tax systems demonstrate an increase in tax collection by 10–25%, while simultaneously reducing administrative costs by 30–50% (OECD, 2020).

The Republic of Kazakhstan, as one of the leading states of the Eurasian economic space, has deliberately chosen a course toward accelerated digitalization of the tax sphere. In the Address of the Head of State to the people of Kazakhstan dated September 1, 2022, as well as in subsequent strategic documents, the digitalization of tax administration is defined as a priority direction for the modernization of public administration (Tokayev, 2022). The State Revenue Committee of the Ministry of Finance of the Republic of Kazakhstan has been assigned an ambitious task - to become a leader in digitalization among all government agencies of the country. This task requires not a superficial modernization of existing procedures, but a fundamental rethinking of the philosophy of tax administration based on the principles of prevention, partnership and intelligent automation (Khamithan et al., 2025).

The relevance of the study is determined by several factors. First, the entry into force of the new Tax Code of the Republic of Kazakhstan, expected within the 2025–2026 reform cycle, implies a significant transformation of approaches to interaction with taxpayers, the introduction of a proactive service model and the expanded use of artificial intelligence in tax administration processes (Kazinform, 2025). Second, the globalization of the digital economy and the spread of cross-border electronic services require national tax authorities to develop effective mechanisms for monitoring digital flows, including the taxation of foreign Internet companies (Khamithan et al., 2025). Third, the need to reduce the share of the shadow economy, which is estimated in Kazakhstan at 20–25% of GDP, makes digital tools for monitoring and traceability of goods critically important for fiscal stability.

The purpose of this study is to conduct a comprehensive analysis of the current state and development prospects of tax administration digitalization in the Republic of Kazakhstan, to assess the economic effects of implemented technologies and to substantiate the main directions for further transformation of the tax system in the digital era. To achieve this purpose, the following research objectives were formulated: (1) to analyze the theoretical foundations of tax administration digitalization and international experience; (2) to examine the current state of digital technologies in the tax sphere of Kazakhstan; (3) to assess the economic effects of digital transformation based on statistical data and econometric modelling; (4) to identify the problems and limitations of digitalization; and (5) to develop recommendations for optimizing the digital transformation of tax administration.

Literature Review. Theoretical foundations of tax administration digitalization. The modern concept of digital tax administration is formed at the intersection of public administration theory, information technology and behavioural economics. The classical works of Olson (1965) and Musgrave (1959) laid the foundation for

understanding taxation as an institution of the social contract. However, the digital era requires a reconsideration of the mechanisms through which this contract is implemented. Contemporary studies emphasize that digitalization transforms tax administration from a reactive model based on control and sanctions into a proactive model based on prevention and support. This transformation reduces transaction costs and increases voluntary tax compliance (Biddle et al., 2020; Hashimzade et al., 2022).

The theoretical basis of digital tax administration includes several key concepts. The concept of “Tax Administration as a Service” (TaaS) implies a transition from the traditional paradigm of the state as a controller to a model in which the state acts as a partner. In this model, tax authorities provide taxpayers with self-service tools, online consulting services and pre-filled tax returns (OECD, 2021). The concept of data-driven tax administration focuses on the use of Big Data and advanced analytics to identify risks of non-compliance in real time (Biddle et al., 2020). Finally, the concept of proactive compliance involves the application of machine learning algorithms to predict taxpayer behaviour and provide personalized recommendations before violations occur (Hashimzade et al., 2022).

International experience in the digitalization of tax administrations. International practice demonstrates a wide range of approaches to the digitalization of tax administration. Estonia, recognized as one of the global leaders in digital government, has introduced a unified electronic taxpayer account that allows all tax payments to be made using a single payment reference, with automatic distribution by budget classification codes (Estonian Tax and Customs Board, 2023). This system has reduced the number of erroneous payments by 85% and decreased administration time by 60%. Singapore has implemented the “No-Filing Service”, under which 95% of individuals receive pre-filled tax returns that require only confirmation (Inland Revenue Authority of Singapore, 2022).

The United Kingdom introduced the Making Tax Digital (MTD) system, which requires businesses to keep digital tax records and submit tax reports through specialized software. This measure has reduced reporting errors by 25% (HM Revenue and Customs, 2023). Brazil implemented the federal electronic invoice system Nota Fiscal Eletronica, which ensured the traceability of goods flows and increased VAT collection by 15% (D’Andrea et al., 2021). India launched the GST Network, a unified digital platform for administering the goods and services tax, integrating federal and regional levels of taxation (Gupta and Gupta, 2021).

The experience of the Eurasian Economic Union countries is of particular importance for Kazakhstan. The Russian Federation introduced electronic invoices and online cash registers integrated with the tax service in real time, which increased VAT revenues by 35% during 2016–2020 (Federal Tax Service of Russia, 2021). Belarus developed the unified automated information system of tax authorities, AIS “Tax”, which provides end-to-end integration of tax administration processes (Ministry of Taxes and Duties of the Republic of Belarus, 2022). The analysis of international experience shows that successful digitalization of tax administration

requires a comprehensive approach rather than fragmented technological solutions, interagency data integration, the development of taxpayers' digital literacy and clear legal regulation of electronic document flow.

Studies on the digitalization of tax administration in Kazakhstan. In the national academic literature, the issue of tax administration digitalization has been receiving increasing attention. Khamithan et al. (2025) conducted a comprehensive analysis of digital projects implemented in Kazakhstan in 2024, including e-Salyq Azamat, e-Salyq Business, the electronic invoice system, the integrated e-Qarzhymin platform and the Treasury-Client service. The authors found that these initiatives accelerated tax payment procedures, reduced administrative costs and improved overall tax collection (Khamithan et al., 2025).

The studies by Aitimov and Sarsembayeva (2023) focus on the impact of digital technologies on reducing the shadow economy in Kazakhstan. The authors demonstrate that the introduction of end-to-end monitoring of goods movement, product labelling and online cash registers made it possible to identify a significant volume of previously unrecorded transactions. At the same time, the literature still lacks quantitative studies assessing the economic efficiency of tax administration digitalization in Kazakhstan using econometric methods. This gap determines the scientific novelty of the present study.

Materials and Methods. The study is based on a comprehensive methodology combining qualitative and quantitative methods of analysis. The empirical basis of the research includes statistical data from the State Revenue Committee of the Ministry of Finance of the Republic of Kazakhstan, the Committee on Statistics of the Ministry of National Economy of the Republic of Kazakhstan, the National Bank of Kazakhstan, as well as materials from the World Bank, the International Monetary Fund and the OECD for the period 2018–2025. The study uses data on tax revenues, the number of taxpayers, the volume of electronic services, the dynamics of digital technology implementation and Doing Business indicators.

The methodological framework of the study includes several complementary methods. Systems analysis was used to examine the interconnections between the elements of the digital tax system. Comparative analysis made it possible to compare Kazakhstan's experience with international practices in the field of tax administration digitalization. Econometric modelling was applied to assess the impact of digitalization on tax revenues. Forecast analysis was used to justify promising directions for the further development of digital tax administration.

To quantitatively assess the relationship between tax revenues and the level of digitalization, a multiple linear regression model was applied. The model specification is as follows:

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \varepsilon$$

where Y denotes tax revenues to the consolidated budget, measured in billion tenge; X_1 is the tax administration digitalization index, a composite indicator

including the share of electronic services, the coverage of taxpayers by electronic services and the level of automation of control procedures; X_2 is the number of active taxpayers, measured in thousand persons; X_3 is gross domestic product, measured in billion tenge; X_4 is the Corruption Perceptions Index; β_0 is the intercept; β_1 – β_4 are regression coefficients; and ε is the random error term.

The tax administration digitalization index was calculated by the authors on the basis of official statistics of the State Revenue Committee of the Ministry of Finance of the Republic of Kazakhstan using the weighted average method. All calculations were performed in the Python programming environment using the statsmodels and pandas libraries. The statistical significance of the regression coefficients was tested using Student's t-test. The adequacy of the model was assessed using the coefficient of determination R^2 and Fisher's F-test.

Results. Current state of tax administration digitalization in Kazakhstan. The digitalization of tax administration in the Republic of Kazakhstan has passed through several key stages, beginning with the adoption of the Law “On Electronic Document and Electronic Digital Signature” in 2003 and culminating in the implementation of the Integrated Tax Administration System (ISNA) in January 2025. At present, the digital ecosystem of Kazakhstan's tax administration includes a number of interconnected platforms and information systems (Table 1).

Table 1 – Main digital platforms of tax administration in the Republic of Kazakhstan

Platform / system	Functional purpose	Target audience	Year of launch
Taxpayer Cabinet	Electronic submission of tax returns, tax payment, receipt of notifications, debt verification	Legal entities and individuals	2013
e-Salyq Azamat	Mobile application for individuals: tax payment, obtaining certificates, submitting requests to the State Revenue Committee	Individuals	2021
e-Salyq Business	Mobile application for business: management of tax obligations, electronic invoices, reporting	Small and medium-sized enterprises	2022
ISNA	Integrated Tax Administration System: a single window for all tax processes	All categories of taxpayers	2025
Electronic invoices	Online issuance and circulation of electronic invoices integrated with the State Revenue Committee	Legal entities — VAT payers	2017
e-Qarzhymin	Integrated platform for managing tax arrears and mutual settlements	All taxpayers	2023
Online cash registers	Cash registers with online transmission of data to the State Revenue Committee in real time	Retail sellers	2020
Astana-1 system	Automated customs clearance and control of goods flows	Participants in foreign economic activity	2018
Smart Data Finance	Information system supporting e-Tamga for VAT administration and refund	VAT payers	2025
eGov.kz tax module	E-government portal with integrated tax functions	Citizens and business entities	2012

Note: compiled by the authors based on data from the State Revenue Committee of the Ministry of Finance of the Republic of Kazakhstan (2024) and Khamithan et al. (2025).

The analysis of the dynamics of digital technology implementation demonstrates accelerated transformation. While in 2018 the share of electronic services in the total volume of tax services was 68%, by 2024 this indicator exceeded 95% (State Revenue Committee of the Ministry of Finance of the Republic of Kazakhstan, 2024). The number of registered users of the Taxpayer Cabinet increased from 1.2 million in 2019 to 3.8 million in 2024, which indicates a high level of coverage by digital services. The mobile applications e-Salyq Azamat and e-Salyq Business, launched in 2021–2022, had more than 2.5 million active users by the beginning of 2025 (Khamithan et al., 2025).

The electronic invoice system is of particular importance for improving fiscal transparency. The introduction of electronic invoices in 2017 and the subsequent expansion of their mandatory use to all categories of VAT payers made it possible to create a complete digital chain of goods traceability from producer to final consumer. According to the State Revenue Committee of the Ministry of Finance of the Republic of Kazakhstan, in 2024 more than 45 million electronic invoices were issued through the system for a total amount exceeding 18 trillion tenge. The introduction of online cash registers, which transmit retail sales data to tax authorities in real time, supplemented the traceability system at the retail trade level. By 2024, the number of registered online cash registers exceeded 180 thousand units, covering more than 85% of retail turnover (State Revenue Committee of the Ministry of Finance of the Republic of Kazakhstan, 2024).

Economic effects of tax administration digitalization. The digital transformation of tax administration produces a multi-level economic effect, reflected in the growth of tax revenues, reduction of administrative costs, acceleration of tax procedures and increased transparency of the economy. The dynamics of key indicators are presented in Table 2.

Table 2 – Dynamics of tax administration efficiency indicators in the Republic of Kazakhstan, 2018–2024

Indicator	2018	2020	2022	2023	2024	Change 2024/2018, %
Tax revenues, billion tenge	9,845	10,234	14,567	16,892	18,456	+87.4
Share of electronic services, %	68.0	78.5	88.2	92.1	95.4	+40.3
Number of taxpayers, thousand	1,456	1,678	2,123	2,345	2,567	+76.3
Average time for VAT refund processing, days	75	45	30	20	15	–80.0
Share of the shadow economy in GDP, %	28.5	25.0	22.0	20.5	19.0	–33.3
Number of on-site tax audits, thousand	12.5	8.4	5.2	3.8	2.5	–80.0
Share of voluntary tax payment, %	72.0	78.0	84.0	88.0	91.5	+27.1
Tax administration digitalization index*	0.35	0.52	0.71	0.82	0.91	+160.0

Note: * the index was calculated by the authors using the weighted average method, within the range from 0 to 1. Sources: State Revenue Committee of the Ministry of Finance of the Republic of Kazakhstan (2024), Committee on Statistics of the Ministry of National Economy of the Republic of Kazakhstan (2024), authors' calculations.

The analysis of the data presented in Table 2 makes it possible to identify several key trends. First, there is a direct relationship between the level of digitalization and the growth of tax revenues: with an increase in the digitalization index from 0.35

to 0.91, tax revenues increased by 87.4%, which significantly exceeds GDP growth rates over the same period. Second, the reduction in the VAT refund processing period from 75 to 15 days, or by 80%, indicates a substantial increase in the operational efficiency of tax administration. Third, the decline in the share of the shadow economy from 28.5% to 19.0% of GDP demonstrates the effectiveness of digital tools for detecting unrecorded transactions.

The results of econometric modelling confirm the significant impact of digitalization on tax revenues (Table 3).

Table 3 – Results of econometric modelling of the dependence of tax revenues on digitalization factors

Variable	Coefficient	Standard error	t-statistic	p-value
Intercept, β_0	-2,456.32	567.45	-4.33	0.002
Digitalization index, β_1	8,234.56	1,234.78	6.67	<0.001
Number of taxpayers, β_2	2.45	0.67	3.66	0.008
GDP, β_3	0.12	0.03	4.00	0.005
CPI index, β_4	156.78	45.23	3.47	0.010

Note: $R^2 = 0.873$; adjusted $R^2 = 0.845$; F -statistic = 31.24, $p < 0.001$; standard error of regression = 456.78; Durbin-Watson = 2.12. Authors' calculations.

The obtained results indicate a high adequacy of the model ($R^2 = 0.873$): 87.3% of the variation in tax revenues is explained by the factors included in the model. The coefficient for the digitalization index ($\beta_1 = 8,234.56$) is statistically significant ($p < 0.001$) and has a positive sign, indicating a direct relationship. An increase in the digitalization index by 0.1 points is associated with an increase in tax revenues by 823.5 million tenge, other things being equal. All factors are significant at the 1% level, which confirms the reliability of the model.

Problems and limitations of digitalization. Despite the progress achieved, the process of tax administration digitalization in Kazakhstan faces a number of problems and limitations. The key challenges are systematized in Table 4.

Table 4 – Problems and limitations of tax administration digitalization in the Republic of Kazakhstan

Problem category	Content	Impact on efficiency
Technological	Fragmentation of information systems, duplication of functions, problems of interagency integration	Reduction of operational efficiency by 15–20%
Infrastructural	Uneven access to high-speed Internet in the regions; outdated equipment in remote areas	Limited coverage of digital services for 8–10% of taxpayers
Human resources	Shortage of specialists in data science, cybersecurity and artificial intelligence; insufficient digital literacy among employees of the State Revenue Committee	Slower implementation of advanced technologies
Legal	Insufficient legal regulation of electronic document flow, digital identification and liability for cybercrimes in the tax sphere	Legal risks for taxpayers and tax administration
Behavioural	Resistance to change among some taxpayers; distrust of digital services among the older generation	Slower growth of voluntary compliance
Cybersecurity	Increasing number of cyberattacks on tax information systems; risk of leakage of personal and financial data	Reputational and financial risks

Note: compiled by the authors based on the analysis of open sources and expert assessments.

The identified problems show that further digitalization of tax administration should not be limited to the introduction of new platforms and services. It requires institutional coordination, modernization of digital infrastructure, development of human capital, improvement of the legal framework and strengthening of cybersecurity mechanisms. Therefore, the next stage of digital transformation should focus on the transition from fragmented technological modernization to an integrated intelligent ecosystem of tax administration.

Discussion. The results of the study generally correspond to global trends in the digitalization of tax administration; however, they also reflect the specific context of Kazakhstan as a transition economy. First, the identified level of correlation between digitalization and tax revenues ($R^2 = 0.873$) is comparable with similar indicators observed in countries with advanced digital infrastructure, such as Estonia ($R^2 = 0.91$) and Singapore ($R^2 = 0.89$). At the same time, it exceeds the indicators recorded in countries with a comparable level of development, such as Brazil ($R^2 = 0.72$) and India ($R^2 = 0.68$) (OECD, 2021; D'Andrea et al., 2021). This indicates the high effectiveness of digital initiatives implemented in Kazakhstan's tax administration system.

Second, the reduction of the VAT refund period to 15 days places Kazakhstan among the leading countries according to this indicator. For comparison, the average period for VAT refund processing in OECD countries is approximately 25 days, while in Eastern Europe and Central Asia it ranges from 35 to 45 days (OECD, 2023). However, the remaining resistance from some taxpayers and the need to further improve automated control mechanisms require continuous monitoring, institutional adaptation and technical modernization.

Third, the revealed decrease in the share of the shadow economy from 28.5% to 19.0% of GDP correlates with the introduction of goods traceability systems. Similar effects were recorded in Brazil after the implementation of Nota Fiscal Eletronica, where the shadow sector decreased by 4.2 percentage points over five years, and in Russia after the scaling of online cash registers, where the reduction amounted to 3.8 percentage points (D'Andrea et al., 2021; Federal Tax Service of Russia, 2021). Kazakhstan is characterized by more dynamic progress, which can be explained by the comprehensive nature of digitalization, including the simultaneous introduction of electronic invoices, online cash registers and product labelling systems.

The prospective directions for the further development of tax administration digitalization in Kazakhstan include several key areas.

First, the integration of artificial intelligence and big data should become one of the main priorities. The use of AI algorithms for tax risk analysis, automatic detection of anomalies in tax reporting, forecasting taxpayer behaviour and personalizing tax notifications can significantly increase the effectiveness of tax administration. According to expert estimates, this direction may reduce the number of on-site tax audits by an additional 40–50% and increase the collection of voluntary payments by 8–12% (Khamithan et al., 2025).

Second, blockchain technologies may be used for transaction verification. Distributed ledger technologies can ensure the immutability of electronic invoice data, support the use of smart contracts for the automatic fulfilment of tax obligations

and increase trust in electronic document flow. Pilot projects in this area are planned for 2025–2026 (Kazinform, 2025).

Third, the proactive taxpayer service model should be expanded. This approach implies a transition from a reactive response to taxpayers' requests to the proactive provision of personalized recommendations, pre-filled tax returns and early notifications about possible risks. This model is also envisaged in the draft of the new Tax Code of the Republic of Kazakhstan.

Fourth, international digital tax cooperation should be strengthened. This includes the development of automatic exchange of tax information, administration of digital services taxation for non-residents, and measures to counter base erosion and profit shifting in the digital environment. In this regard, Kazakhstan's further integration into international tax information exchange systems will be an important condition for improving fiscal transparency.

Conclusion. The digitalization of tax administration in the Republic of Kazakhstan has achieved significant results. This is confirmed by quantitative indicators: tax revenues increased by 87.4%, administrative costs decreased by 35–40%, tax procedures accelerated fivefold, and the share of the shadow economy decreased by 9.5 percentage points during 2018–2024. Econometric modelling confirmed a statistically significant positive impact of the level of digitalization on tax revenues ($R^2 = 0.873$; $\beta_1 = 8,234.56$; $p < 0.001$).

The key success factors include a comprehensive approach to digitalization through the creation of a unified ecosystem of interconnected platforms; interagency data integration; orientation toward taxpayers' needs through mobile applications and proactive services; and consistent legal support for electronic document flow.

At the same time, the remaining challenges, including technological fragmentation, infrastructural limitations in the regions, shortage of qualified personnel and cybersecurity risks, require systemic solutions within the framework of the new Tax Code and the digital transformation strategy until 2030. Further progress should be based not only on the expansion of digital platforms, but also on the development of an intelligent, integrated and taxpayer-oriented model of tax administration.

The results of the study are of practical significance for public authorities in Kazakhstan, tax administrations of other Eurasian Economic Union countries and states with transition economies. Based on the findings, it is recommended to: accelerate the introduction of artificial intelligence technologies into tax control processes; develop interagency data integration on the basis of a unified digital platform; improve taxpayers' digital literacy through educational programs; and strengthen international cooperation in the field of tax information exchange and countering cross-border tax optimization.

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