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TRANSFORMING PUBLIC SECTOR ACCOUNTING THROUGH DIGITAL INNOVATION

Abstract

Digitalisation is changing not only the technical side of public sector accounting but also the way financial information is produced, checked and used in public decision-making. This article examines that process in Kazakhstan, focusing on the Integrated Automated Information System "e-Minfin," the use of International Public Sector Accounting Standards (IPSAS), the digitalisation of the Supreme Audit Chamber and the introduction of the Digital Tenge. The analysis considers both the practical functions of these initiatives and the constraints that become visible when digital tools are incorporated into existing institutions.

The evidence reviewed in the study suggests that technology by itself does not resolve weaknesses in financial control. The effect of digitalisation depends on whether information systems exchange reliable data, whether internal control procedures work as intended and whether public institutions have staff able to use the new tools. Kazakhstan's experience is also considered alongside selected practices in France and South Korea. The comparison points to the importance of interoperability, clearly assigned institutional responsibilities and continuous professional development. For public sector accounting and audit, the next stage of reform is therefore likely to involve wider use of data analytics, artificial intelligence and programmable financial instruments, but within stronger governance and control arrangements.

Keywords: public sector accounting, digital transformation, state audit, algorithmic governance, e-Minfin, Digital Tenge, artificial intelligence.

INTRODUCTION

Public sector accounting is increasingly carried out in an environment where financial data are generated and processed electronically. This changes the practical requirements placed on accounting and control. Retrospective checks and manual reconciliation remain relevant, but they are no longer sufficient when budget execution, procurement and reporting systems operate continuously and exchange large volumes of data.

This shift is visible in several areas of public financial management. Integrated Financial Management Information Systems bring previously separate operations into common digital environments; accrual-based standards, including IPSAS, require more structured and comparable financial information; and central bank digital currency projects create new possibilities for tracing and, in some cases, programming public payments. These developments affect the institutional process of collecting, recording, transferring and auditing public resources rather than simply replacing paper documents with electronic ones.

The issue is particularly relevant for governments that are expected to improve fiscal transparency while managing growing volumes of transactions and tighter requirements for accountability. Digital tools can reduce processing time and support earlier identification of errors or unusual transactions. Their value, however, depends on how well they are incorporated into the wider system of budget management, internal control and public audit.

For accounting practice, the most immediate effects are greater speed of data exchange, standardisation of routine operations and the possibility of applying automated controls before a payment is completed. Risk-analysis tools can also help auditors and financial-control bodies focus attention on transactions that require

additional review. At the same time, reliance on integrated databases creates new dependencies: errors in source data, weak access controls or poorly designed algorithms can be reproduced across several stages of the financial-management cycle.

These circumstances make the institutional side of digitalisation as important as the technology itself. Public organisations introduce new systems within existing legal rules, administrative routines and professional practices. As a result, the same technology may produce different outcomes depending on data quality, staff skills, organisational incentives and the distribution of responsibility between institutions. This study therefore treats digital public finance as a socio-technical reform and asks how the new infrastructure works in practice, with particular attention to the conditions that support or limit its contribution to transparency and control in an emerging economy.

The purpose of the study is to examine how the digital transformation of public sector accounting is developing in the Republic of Kazakhstan. During the last two decades, the country has expanded electronic systems for accounting, treasury operations, procurement and state audit. More recent initiatives also include programmable payments and the use of data analytics in financial control.

The analysis concentrates on three areas: the structure and operation of e-Minfin, the digitalisation of the Supreme Audit Chamber, and the use of the Digital Tenge in selected budget and procurement processes. The study evaluates these initiatives in terms of their implications for the organisation of financial operations, the reliability of control and the gradual shift toward data-based public financial management.

METHODOLOGY AND METHODS

A qualitative research design was used, combining literature review, institutional case analysis and comparative assessment. Institutional Theory serves as the analytical lens because digital reform in the public sector is shaped not only by technical capacity but also by regulation, professional standards, established routines and external policy expectations. This approach helps distinguish between the formal introduction of a digital tool and the institutional conditions required for it to function effectively.

The literature review covered peer-reviewed publications indexed in Scopus and Web of Science for 2010–2026. Sources were selected around five themes: digital transformation of the public sector, government accounting, e-government, IPSAS implementation and the digitalisation of audit and algorithm-based governance. The empirical part of the study draws on official documents, state audit materials, statistical information and national policy documents concerning Kazakhstan's public financial management. Within this material, particular attention was paid to e-Minfin, the digital development of the Supreme Audit Chamber and the Digital Tenge.

The analysis proceeded in three steps. First, the study examined the development of digital accounting infrastructure and the links between public information systems. Second, state-audit findings were used to assess how the systems function in practice and what compliance problems remain. Third, the Kazakhstan case was compared with selected digital public-finance practices in France and South Korea. The purpose of this sequence was to connect the technical architecture of reform with observable institutional effects and implementation constraints.

LITERATURE REVIEW

The literature increasingly treats digitalisation of public sector accounting as an organisational and institutional change rather than as a stand-alone technology project. Recent studies link the use of digital systems to changes in reporting, audit procedures, decision-making and the distribution of responsibility inside public institutions. The main point across this literature is that expected gains in transparency or efficiency are conditional: they depend on governance arrangements, data quality and the capacity of organisations to use the new infrastructure consistently.

Audit is one of the areas where this tension is especially visible. Otia and Bracci (2022) argue that Supreme Audit Institutions have to adapt their methods to financial environments built around automated processes, interconnected databases and electronic transactions. Traditional procedures remain necessary, but they may not capture risks embedded in system design or data flows. Spanò et al. (2026) reach a similar conclusion and show that digitalisation can support audit quality or produce limited results depending on institutional preparedness and the way new tools are integrated into existing audit practice.

A second strand of research concerns the quality and integration of accounting information systems. Hamdy et al. (2025) report that digital transformation can improve the timeliness, accessibility and reliability of accounting information in developing countries, while also noting problems caused by uneven implementation across institutions. Lestari (2025) likewise associates data-driven accounting with greater transparency and accountability, but stresses that these benefits increase dependence on stable infrastructure, reliable data and appropriate digital-governance arrangements.

Other studies place greater emphasis on coordination and professional capacity. Bekiaris et al. (2026) show that public-sector accounting reform depends on cooperation between organisations and on the alignment of

governance mechanisms with stakeholder responsibilities. Heiling (2026) draws attention to the growing role of intangible and digital assets, which are not always well represented in traditional accounting approaches. Väyrynen et al. (2023) view public-sector digital transformation as a co-creative process involving government, citizens and digital platforms, while Gunasilan (2024) discusses the effects of artificial intelligence, blockchain and cloud technologies on reporting and audit transparency.

Evidence from transition economies adds an important institutional perspective. Quwanishbaevna (2025), examining Uzbekistan, links digital reform in public sector accounting with improvements in audit integrity and operational efficiency, but identifies institutional capacity as a continuing constraint. Kuldosheva (2021) also notes that ICT-based public-sector reform in Uzbekistan faces structural limitations even where the longer-term potential for modernisation is substantial.

For Kazakhstan, Yeraliyeva et al. (2023) connect digitalisation with broader changes in public administration and economic modernisation. Their findings are relevant to public finance because accounting and audit systems increasingly operate inside the same national digital-governance environment. This makes coordination between legal rules, administrative procedures and information systems a practical issue rather than a purely technical one.

Taken together, the reviewed studies support three observations. Digital tools can improve the speed, traceability and analytical use of public financial information; these effects depend heavily on institutional readiness and governance; and new technologies also create risks that were less prominent in paper-based systems, especially fragmentation, cybersecurity exposure and uneven digital capacity. These observations provide the framework for interpreting the Kazakhstan case.

RESULTS

Kazakhstan offers a useful case because several components of public financial management have been digitalised in parallel. Treasury operations, public procurement, accounting, state audit and selected payment mechanisms are increasingly connected through common information infrastructure. The reforms considered below do not represent a single project; rather, they show how different elements of the financial-management cycle are being brought into a more integrated digital environment.

The core platform in this environment is the Integrated Automated Information System “e-Minfin.” It automates a range of Ministry of Finance processes and brings together data generated by different public institutions. In practical terms, the system centralises financial information, reduces repeated manual processing and gives public bodies faster access to information on budget execution.

Official data for 2024 report more than 570,000 registered users of the e-Minfin web portal and interaction with about 24,000 public sector entities. Public procurement transactions supported by the platform exceeded 9.2 trillion tenge during the year (Ministry of Finance of the Republic of Kazakhstan, 2026). The figures show that e-Minfin is not a narrow accounting application but infrastructure used across a large part of Kazakhstan’s public financial system.

The “Treasury-Client” subsystem illustrates this scale more clearly. By 2024 it connected the central treasury with around 14,900 state institutions and 2,347 local government bodies through electronic document exchange. More than 12 million payment documents were processed annually, together with roughly 951,000 adjustments to budget plans, while daily transaction volumes exceeded 350,000. Such workloads make automated processing essential, but they also increase the importance of stable system operation and reliable data exchange between participating institutions.

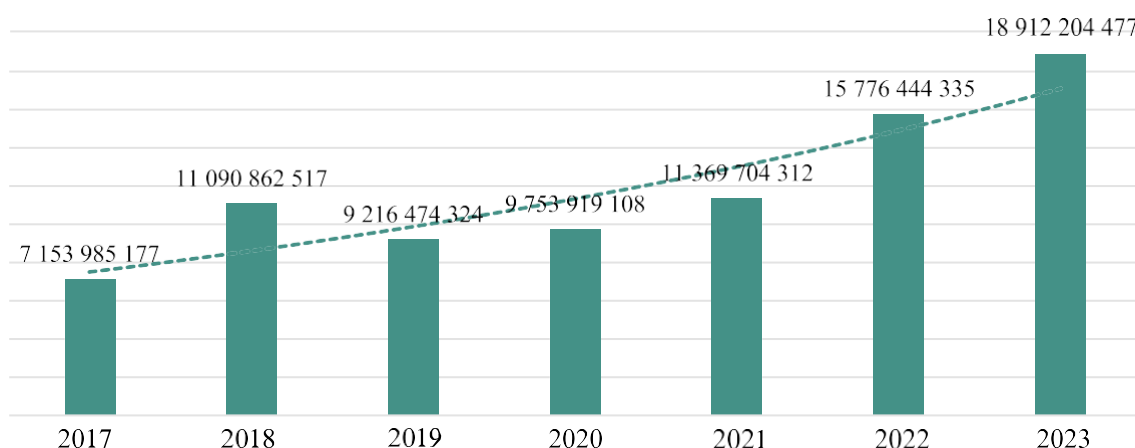


Figure 1. Dynamics of Tax Revenues and Payments to the State Budget of the Republic of Kazakhstan (2017–2023)

Note: The figure is compiled by the author based on data from the SRC MF RK

Figure 1 shows a marked increase in tax revenues and payments to the state budget between 2017 and 2023: the reported amount rose from about 7.15 trillion tenge to 18.91 trillion tenge. This period also overlaps with the expansion of the “Treasury-Client” subsystem and the broader e-Minfin environment (Ministry of Finance of the Republic of Kazakhstan, 2026).

The timing suggests that digital treasury infrastructure may have supported some administrative improvements, for example faster processing, more consistent reconciliation and better traceability of payments. These mechanisms can contribute to payment discipline and make the movement of funds easier to monitor. The revenue series itself, however, does not measure the independent effect of digitalisation.

Budget revenue is affected by many factors, including inflation, economic activity, tax-policy changes and the composition of the revenue base. For that reason, Figure 1 should not be read as evidence that e-Minfin caused the increase in receipts. It is more appropriately interpreted as contextual evidence showing that digital infrastructure expanded during a period of substantial growth in the volume of public financial transactions.

e-Minfin consists of ten interconnected subsystems covering different stages of public financial management. The Financial Control and Risk Management subsystem is used to automate risk assessment and to monitor operations across procurement and treasury platforms. Its purpose is to identify transactions with higher risk indicators and provide analytical information for further review, thereby moving part of financial control closer to the point at which transactions are executed.

The Accounting subsystem brings together primary accounting data, records information on state assets and supports monitoring of daily financing plans. More than 3.5 million standardised accounting documents have been generated through the subsystem. Standardisation is relevant not only for processing speed: it also makes accounting records easier to compare across institutions and reduces variation in routine documentation.

The Financial Reporting Consolidation subsystem addresses a different problem. When public-sector entities transact with one another, transfers or loans may appear in the accounts of more than one institution. The subsystem automates the elimination of such intra-governmental transactions when consolidated statements are prepared, reducing the risk that the same financial flow is counted twice at different levels of government.

System integration is provided through the Enterprise Service Bus, which links e-Minfin with external state databases, including the National Bank, e-licensing services, law-enforcement bodies and anti-corruption institutions. The practical value of this architecture lies in data exchange: financial-control procedures can draw on information held outside the Ministry of Finance rather than relying only on documents submitted within a single system.

Digital infrastructure has developed alongside changes in public-sector accounting methodology. Kazakhstan has moved toward accrual-based accounting and the use of IPSAS, increasing the volume and complexity of information that must be consolidated across public institutions. In this setting, e-Minfin supports the standardisation and aggregation of financial reporting and therefore provides part of the technical infrastructure required for applying common accounting rules at the national level.

Professional competence is another part of this transition. The Ministry of Finance has cooperated with the Association of Chartered Certified Accountants (ACCA), including through the CertIPSAS programme for public-sector financial specialists. Such training is relevant because the practical use of IPSAS increasingly requires staff

to work with both accounting standards and digital information systems rather than treating them as separate areas of expertise.

The Supreme Audit Chamber is also increasing its use of digital tools. A specialised electronic audit module within e-Minfin applies 61 risk indicators to support remote monitoring and risk-oriented audit procedures. This does not replace professional judgement, but it allows auditors to screen a larger set of financial operations and to identify transactions that may require closer examination before an on-site or detailed audit stage.

State-audit findings also show the limits of a technology-centred approach. Automated controls can reveal weaknesses that were difficult to detect in fragmented or paper-based processes, but they do not remove those weaknesses by themselves. The effectiveness of digital audit therefore depends on access controls, data governance, internal-control design and managerial responsibility as much as on the analytical capacity of the software.

The 2025 audit of Joint Stock Company “Electronic Finance Center,” the organisation responsible for developing and maintaining several public-finance information systems, provides a concrete example. The audit reported problems in strategic reporting, pricing approaches and information security. It also recorded more than 600 cases of unauthorised manual intervention in the “Electronic Public Procurement” system, including interventions affecting automated checks of supplier qualifications and licence information.

After these findings, the Supreme Audit Chamber expanded the use of Big Data analytics and artificial intelligence in its audit work. The stated objective is to supplement sample-based procedures with wider analysis of transaction-level data and automated identification of unusual or high-risk operations (Ministry of Finance of the Republic of Kazakhstan, 2026). The change is significant because it increases the volume of information that can be reviewed, while also creating a need to validate the data and rules used by the analytical models.

The Digital Tenge introduces another form of digital control into public finance. As a central bank digital currency based on distributed-ledger technology, it can be used not only for payment but also for transactions in which conditions are attached to the use of funds. Kazakhstan has tested this feature in budget-related projects, and a phased expansion of the Digital Tenge across levels of the budget system, including local budgets and state-owned holding companies, was scheduled to begin in 2026.

Its most relevant feature for public financial management is programmability. Conditions can be attached to a digital payment so that funds are used only for specified purposes or categories of expenditure. In practice, this creates a form of purpose-bound or “coloured” money in which part of the compliance rule is applied at the payment stage rather than checked only after expenditure has occurred.

One pilot involved construction of the Dostyk–Moitynty railway line. Digital budget funds were linked to authorised expenditure categories, including construction materials, machinery fuel and payroll. Transfers outside the contractual purpose were restricted. When the required contractual conditions and implementation stages were confirmed through connected government systems, the restrictions could be lifted and the funds could circulate as ordinary tenge.

The Digital Tenge has also been tested together with the E-Tamga system in the “Digital VAT” pilot. In business-to-business transactions conducted in digital tenge, the VAT component is identified separately from the remainder of the payment. That amount can then be directed to the state budget or transferred through the electronic invoicing chain to another registered VAT payer.

Reported pilot results indicate that this arrangement can improve traceability and shorten administrative procedures. The processing period for VAT refunds was reported to have fallen from about 90 days to around 5 days, while the expected annual fiscal effect was estimated at 100 billion tenge through reduced opportunities for tax evasion and concealment of taxable transactions. These results should be treated as pilot evidence, but they show how Kazakhstan is moving from electronic record-keeping toward the use of automated rules inside tax and budget transactions.

DISCUSSION

The Kazakhstan case shows that digitalisation is changing the organisation of accounting and audit, but the change is uneven across institutions. Central bodies such as the Ministry of Finance, the National Bank and the Supreme Audit Chamber already use integrated information systems, risk analysis and programmable payment tools. By comparison, integration at local and municipal levels remains less complete. The contrast is important because public financial management operates as a chain: a weakness in one part of the chain can limit the value of automation elsewhere.

Fragmentation between central and local systems can delay data exchange and make continuous control more difficult. It also creates a practical problem for automated oversight: a rule can work only if the required data are available in a compatible and reliable form. This helps explain why the expansion of digital monitoring does not automatically eliminate financial irregularities.

A second finding is the gradual movement from purely retrospective control toward preventive forms of oversight. The Digital Tenge and smart-contract mechanisms allow certain spending conditions to be applied

before or during a transaction. In such cases, part of compliance control is built into the execution of the payment instead of being tested only after the money has been spent.

This change broadens the work expected from state auditors. Auditors still need to verify completed transactions and supporting documents, but they increasingly also have to assess data reliability, automated control rules, algorithmic logic and information-system security. The object of audit is therefore expanding from individual transactions to the digital systems that generate, filter and authorise those transactions.

The institutional evidence also points to a combined human-capital and cybersecurity challenge. Alignment with IPSAS and the availability of professional certification do not by themselves ensure that every organisation has sufficient digital skills or readiness. The recorded cases of unauthorised intervention in automated systems are especially relevant here: they show that formal automation can coexist with manual workarounds and weak controls. As financial data become more centralised, the consequences of access-control failures or poor data governance may also become more systemic.

CONCLUSION

Kazakhstan's experience demonstrates that digital reform in public sector accounting is already affecting the full financial-management cycle, from accounting and reporting to audit and selected payment processes. e-Minfin has created a common infrastructure for a large volume of public financial operations, while IPSAS-based reporting, risk-oriented audit tools and Digital Tenge pilots have added new requirements for standardisation, traceability and control. The main result is not the replacement of conventional accounting by technology, but a change in how accounting information is produced, connected and used for oversight.

The development of programmable payments and data-based audit also changes the timing of control. Some compliance conditions can now be checked before or during the execution of a transaction, while analytical tools allow auditors to examine much larger sets of data than traditional sampling alone. This creates opportunities for earlier intervention, but it also means that the quality of control increasingly depends on the rules coded into systems, the reliability of source data and the security of access to financial platforms.

The evidence therefore supports a cautious conclusion. Digital technologies can strengthen public sector accounting and audit when they are accompanied by interoperable systems, effective internal controls and staff with appropriate accounting and digital competencies. Where these conditions are weak, automation may reproduce existing institutional problems or create new ones. Further development of Kazakhstan's digital public finance should consequently combine technological investment with improvements in data governance, cybersecurity, professional training and responsibility for the operation of automated controls.

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**ТРАНСФОРМАЦИЯ БУХГАЛТЕРСКОГО УЧЕТА ГОСУДАРСТВЕННОГО СЕКТОРА
ПОСРЕДСТВОМ ЦИФРОВЫХ ИННОВАЦИЙ****Хуан Лу**

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Аннотация

Цифровизация государственного учета меняет не только используемые инструменты, но и сам порядок формирования, проверки и использования финансовой информации. В статье этот процесс рассматривается на примере Казахстана. В центре анализа находятся интегрированная автоматизированная информационная система «e-Minfin», применение IPSAS, цифровизация деятельности Высшей аудиторской палаты и внедрение цифрового тенге. Оцениваются как практические возможности этих решений, так и ограничения, возникающие при их включении в действующую систему государственного финансового управления.

Проведенный анализ показывает, что наличие цифровой платформы само по себе не гарантирует результативного финансового контроля. Эффект зависит от качества интеграции информационных систем, надежности данных, состояния внутреннего контроля и компетенций работников. Сопоставление казахстанского опыта с отдельными практиками Франции и Южной Кореи подтверждает значение совместимости цифровых платформ, четкого распределения институциональной ответственности и постоянного профессионального обучения. Дальнейшее развитие государственного учета и аудита связано с более широким использованием аналитики данных, искусственного интеллекта и программируемых финансовых инструментов при одновременном усилении требований к управлению данными и контролю.

Ключевые слова: бухгалтерский учет государственного сектора, цифровая трансформация, государственный аудит, алгоритмическое управление, e-Minfin, цифровой тенге, искусственный интеллект.

ЦИФРЛЫҚ ИННОВАЦИЯЛАР АРҚЫЛЫ МЕМЛЕКЕТТІК СЕКТОРДАҒЫ БУХГАЛТЕРЛІК ЕСЕПТІ ТРАНСФОРМАЦИЯЛАУ

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Аңдатпа

Мемлекеттік сектордағы есепті цифрландыру қолданылатын құралдарды ғана емес, қаржылық ақпараттың қалыптасуы, тексерілуі және басқарушылық шешімдерде пайдаланылу тәртібін де өзгертеді. Мақалада бұл үдеріс Қазақстан мысалында қарастырылды. Талдаудың негізгі объектілері – «e-Minfin» интеграцияланған автоматтандырылған ақпараттық жүйесі, IPSAS стандарттарын қолдану, Жоғары аудиторлық палатаның қызметін цифрландыру және цифрлық теңгені енгізу. Зерттеуде аталған шешімдердің практикалық мүмкіндіктерімен қатар, оларды қолданыстағы мемлекеттік қаржыны басқару жүйесіне енгізу барысында байқалатын шектеулер де бағаланды.

Талдау цифрлық платформаның болуы өздігінен тиімді қаржылық бақылауды қамтамасыз етпейтінін көрсетті. Нәтиже ақпараттық жүйелердің өзара ықпалдасу сапасына, деректердің сенімділігіне, ішкі бақылаудың жай-күйіне және мамандардың құзыреттеріне байланысты. Қазақстан тәжірибесін Франция мен Оңтүстік Кореядағы жекелеген практикалармен салыстыру цифрлық платформалардың үйлесімділігі, институционалдық жауапкершіліктің нақты бөлінуі және тұрақты кәсіби даярлық маңызды екенін көрсетеді. Осыған байланысты мемлекеттік сектордағы есеп пен аудиттің келесі кезеңі деректерді талдау, жасанды интеллект және бағдарламаланатын қаржылық құралдарды кеңірек пайдаланумен қатар, деректерді басқару, киберқауіпсіздік және автоматтандырылған бақылау тетіктері үшін жауапкершілікті күшейтуді талап етеді.

Түйін сөздер: мемлекеттік сектордың бухгалтерлік есебі, цифрлық трансформация, мемлекеттік аудит, алгоритмдік басқару, e-Minfin, цифрлық теңге, жасанды интеллект.