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IMPACT OF SMART CONTROL MODELS ON FINANCIAL AND BUDGETARY MANAGEMENT IN TERMS OF DIGITAL TRANSFORMATION

Impacto dos modelos de controle inteligente na gestão financeira e orçamentária em termos de transformação digital

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ABSTRACT

This article examines the transformation of the state financial control system in the Russian Federation under the influence of digitalization in public administration. The primary focus is on developing a SMART control model as a legal and technological tool to enhance the transparency, accountability, and efficiency of budgetary processes. The authors analyze institutional changes and propose a multi-level digital control model comprising legal, organizational, and analytical components. The research draws on international experience in digital public governance and explores the potential for integrating the Russian model into a broader transnational framework of financial compliance and fiscal oversight. The article discusses the risks and prospects of implementing digital platforms in public administration, considering legal certainty, technological compatibility, and strategic sustainability. The results are relevant for developing public policy on digital sovereignty, legal guarantees of budgetary control, and the international harmonization of approaches to public finance management.

Keywords: State financial control, Digitalization of public administration, Stages of digitalization, Efficiency of public administration, Model of digital public financial control

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IMPACTO DOS MODELOS DE CONTROLE INTELIGENTE NA GESTÃO FINANCEIRA E ORÇAMENTÁRIA EM TERMOS DE TRANSFORMAÇÃO DIGITAL

Impact of SMART control models on financial and budgetary management in terms of digital transformation

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RESUMO

Este artigo examina a transformação do sistema de controle financeiro estatal na Federação Russa sob a influência da digitalização na administração pública. O foco principal é o desenvolvimento de um modelo de controle SMART como ferramenta legal e tecnológica para aprimorar a transparência, a responsabilização e a eficiência dos processos orçamentários. Os autores analisam as mudanças institucionais e propõem um modelo de controle digital multinível, abrangendo componentes legais, organizacionais e analíticos. A pesquisa baseia-se na experiência internacional em governança pública digital e explora o potencial de integração do modelo russo a uma estrutura transnacional mais ampla de conformidade financeira e supervisão fiscal. O artigo discute os riscos e as perspectivas da implementação de plataformas digitais na administração pública, considerando a segurança jurídica, a compatibilidade tecnológica e a sustentabilidade estratégica. Os resultados são relevantes para o desenvolvimento de políticas públicas sobre soberania digital, garantias legais de controle orçamentário e a harmonização internacional de abordagens para a gestão das finanças públicas.

Palavras-chave: Controle financeiro estatal, Digitalização da administração pública, Etapas da digitalização, Eficiência da administração pública, Modelo de controle financeiro público digital

INTRODUCTION

State financial control is evolving and transforming under constantly changing economic and political processes within the Russian Federation and beyond. Innovative tools are integrated into control mechanisms, while approaches, methodologies, techniques, and even the very processes of oversight are improved. Management procedures that were once complex and labor-intensive are now fully automated. Under current conditions, it is virtually impossible to enhance the effectiveness and quality of state financial control without digital technologies. In addition, modern technologies enable comprehensive monitoring, making preliminary control more effective and results-oriented (Isaev et al., 2022).

All this has necessitated the development and implementation of the departmental project by the Ministry of Finance of the Russian Federation and the Federal Treasury titled "Electronic SMART Control (Controlling) and Accounting of Public Finances for Managerial Decision-Making" (hereinafter referred to as the "departmental project"). Its objectives include enhancing the transparency and justification of budget appropriations, ensuring the openness of calculation and accounting mechanisms for appropriation outcomes, facilitating timely managerial decisions regarding federal budget execution, and establishing a Unified Electronic System for the Formation of Data (UESFD) for accounting and reporting of public finances within the budget system of Russia. It also aims to create an integrated electronic UESFD environment for the automated controlling, analysis, and accounting of public finances. However, the implementation of the departmental project does not currently provide for the creation of a subsystem within the State Integrated Information System "Electronic Budget" that would enable a comprehensive enhancement of the efficiency and quality of operations performed by financial control bodies and other participants in the budgetary process, as well as the establishment of effective interaction among them.

In the public sector, control using digital technologies can be applied across various areas, including public finance management, state property administration, delivery of public services, and oversight of compliance with laws and regulations. This form of control consolidates an automated system for monitoring and management, enabling the rapid acquisition of information on the status of objects and processes, facilitating data analysis, and supporting well-founded and informed decision-making.

Applying digital technologies in financial and budgetary control enhances the transparency and accountability of financial operations, optimizes public finance management processes, reduces financial risks, and ensures the financial system's stability. It will also improve coordination between financial control bodies and other participants in the budgetary process. The modern public sector requires an effective tool for managing finances and budgets. In this regard, a priority area is developing the SMART Control System in the Financial and Budgetary Sphere (hereinafter referred to as SMART CFBS), as a new subsystem of the State Integrated Information System "Electronic Budget".

The digital transformation of public administration has been actively studied over the past several years (Andersen et al., 2010; Andersen et al., 2011; Janowski, 2015; Bannister and Connolly, 2014; Zahir et al., 2023). The role of state digital policy and digitalization in improving the efficiency of public administration is emphasized by Febiri et al. (2024), Yumiao et al. (2025), Xiang and Shujing (2025). Ion et al. (2024) highlight the positive impact of digitalization in public institutions across all five management functions: planning, organizing, coordinating, motivating, and controlling.

Smart public governance is explored by Oliveira and Fernandes (2024), Yee et al. (2025), as well as He et al. (2025) and Guanying et al. (2025). The challenges and benefits of blockchain technology in digital transactions and smart contracts are addressed in the studies by Niosha Hejazi and Arash Lashkari (2025), Chidiebere and Ameyaw (2025). The potential of digitalization to create synergistic efficiency in public administration, including in achieving sustainable development goals, is examined by Li and Liang Hn (2025), Xu et al. (2025), as well as Fedchenko et al. (2023).

The analysis of existing research in digital transformation of public administration and financial control shows a strong interest in the application of intelligent technologies in the public sector, particularly for enhancing transparency, accountability, and the effectiveness of managerial decision-making. However, the issue of organizational, methodological, and legal structuring of digital models for internal state financial control integrated within a unified state digital ecosystem remains insufficiently developed in both academic and practical literature.

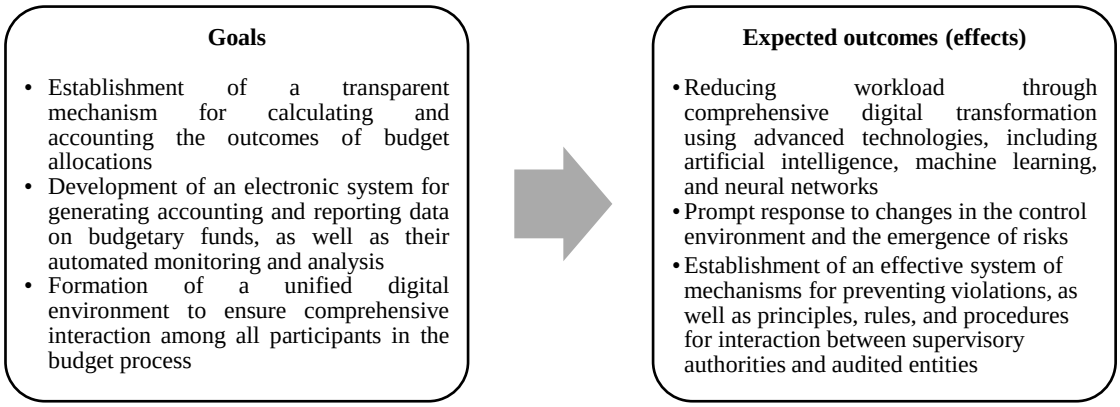
Thus, this study aims to develop a SMART control model for the financial and budgetary sphere as an innovative component of the digital transformation of public administration. This model is intended to ensure legal certainty, functional integrity, and sustainable interaction among participants in the budgetary process in the context of an evolving digital environment.

1 METHODOLOGICAL FRAMEWORK

The methodological framework is based on theoretical principles related to the organization of state financial control and public oversight, methodological approaches to structuring internal state financial control, and the scientific rationale for the digital organization of internal state financial control in Russia.

In the course of the research, we proceeded from the assumption that the proposed SMART CFBS digital model would be implemented and applied in the following areas: forecasting the future state of financial and budgetary entities under the influence of internal and external factors; planning activities within the financial and budgetary sphere, including goal setting, task formulation, and determination of means, methods, and measures for achieving those goals; supporting organizational measures that consider resource and authority distribution, the functional zones of departments, and the formation or modification of an entity's internal structure in the financial and budgetary sphere; regulating the functioning of the system within defined parameters through the adoption of legal acts that determine the legal status of financial and budgetary entities and the legal framework for implementing budgetary procedures; and creating conditions to incentivize civil servants and employees within financial and budgetary institutions. Based on this, we identified the objectives and expected outcomes of implementing the SMART CFBS system (Figure 1).

Figure 1 - Goals and expected outcomes of implementing the SMART CFBS system



Source: compiled by the authors

In this context, we developed the SMART CFBS model, designed to automate and optimize the management processes of financial control authorities and other participants in the budgetary process (Figure 2).

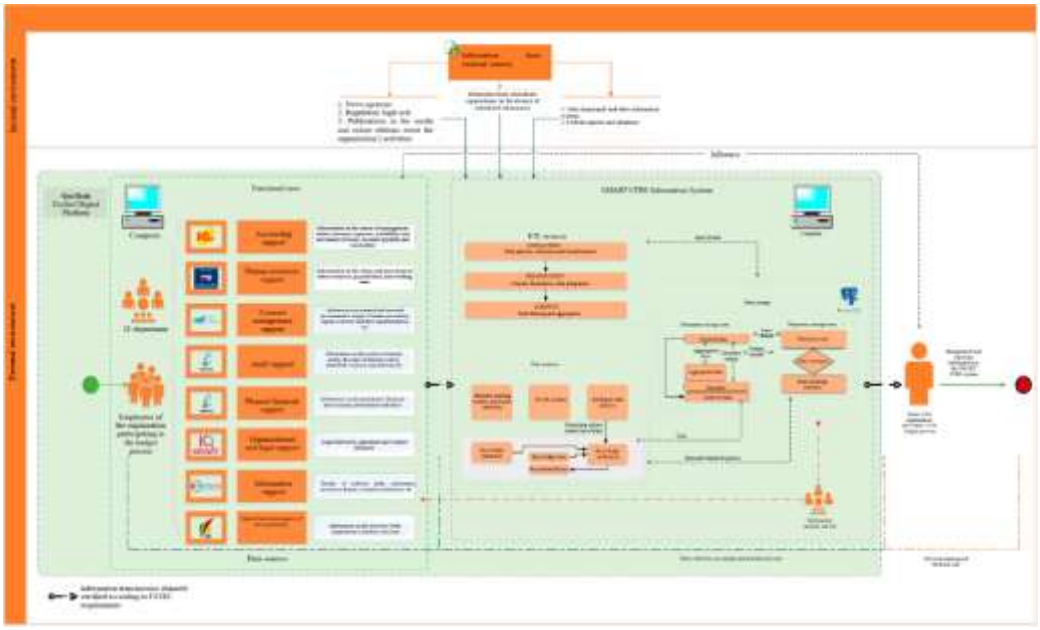
In the proposed model, the control system based on digital technologies consists of an internal environment (functional zone, control information system) and an external environment (external information flow unit). The internal environment encompasses not only hardware and data arrays but also software, system users, and personnel of financial and budgetary entities, i.e., users of software products who serve as information sources for the control environment, as well as the staff responsible for maintaining the system.

Within the SMART CFBS system, information plays a crucial role as it serves as the foundation for control activities. This requires data from both internal sources covering all budgetary procedures and external sources. External sources include: regulatory legal acts governing the activities of financial and budgetary entities and institutions; media publications related to the financial and budgetary sector or the activities of the entities being monitored; information from subordinate organizations about ongoing business processes, in cases where a

centralized system of internal information exchange is absent; demographic data from the Unified Population Register; data from other subsystems of the State Integrated Information System “Electronic Budget”.

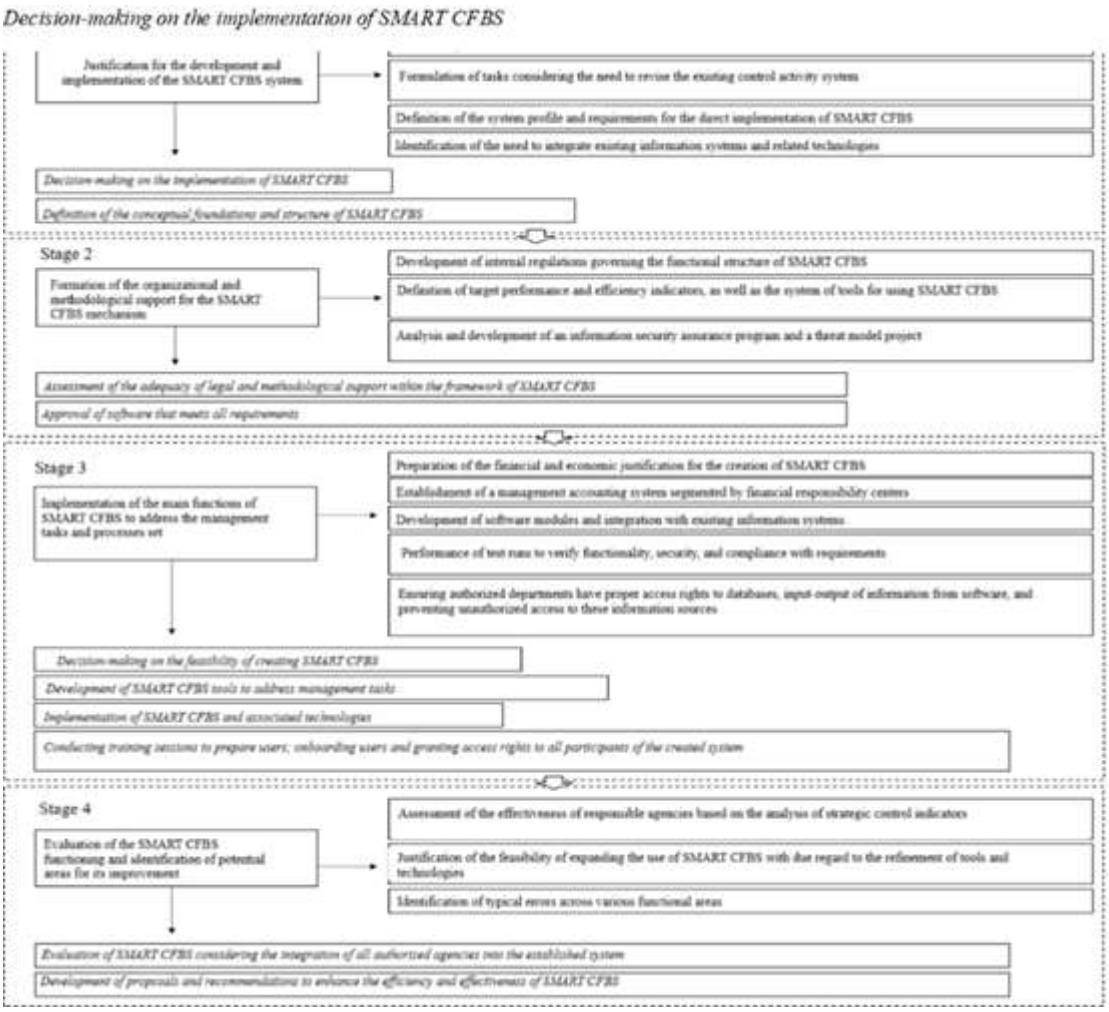
Based on the requirements outlined in current regulatory legal acts concerning the development of state information systems, the study proposes a series of sequential stages for the creation and development of the new SMART CFBS information system (Figure 3).

Figure 2 - Our model of SMART control in the financial and budgetary sector



Source: compiled by the authors

Figure 3 - Stages of forming the SMART CFBS system



Source: compiled by the authors

The development of the SMART CFBS system is intended to be based on the Unified Digital Platform "GosTech". This is a centralized digital infrastructure designed to ensure compliance with confidentiality requirements for data stored and accumulated within government information systems. In addition, this platform enables the integration of all existing and newly developed information systems.

An effective SMART CFBS system must ensure a complete management cycle for financial and budgetary processes. To achieve this, it is essential to develop dedicated SMART CFBS tools that will facilitate the effective coordination of actions, eliminate errors, and prevent duplication of tasks. The study proposes a set of such tools which, when integrated with the functional zones of the SMART control model in the financial and budgetary sphere, constitute a comprehensive system for efficient financial management both at the level of an individual budgetary organization and for the national public finances.

2 RESULTS

Thus, the development of the SMART CFBS system must follow a sequence of stages in designing and implementing the new information system, beginning with a diagnostic assessment (Figure 3).

Stage 1 primarily serves diagnostic purposes. At this stage, the entire system of existing methodologies and their effectiveness is assessed to justify the need for introducing SMART CFBS (Angelina et al., 2018). The decision to adopt an innovative approach to state financial control is based on a critical assessment conducted

during the analysis. The main objective of the first stage is to identify an objective need for integrating the new system into current control methodologies.

Key factors that determine the necessity of implementing the proposed system include the volume of information processed by institutions, submitted to regulatory bodies. Digital resources contribute to enhancing discipline in the use of public funds and record-keeping processes (Horvath & Partners, 2005). Another factor influencing the decision may be the need to ensure transparency in the allocation of budgetary appropriations by recipients for approved purposes.

At the first stage of the development and implementation of SMART CFBS, experts assess the current system for executing institutional functions and exercising authority, identifying its weaknesses and internal inconsistencies. The experts are also responsible for setting objectives and defining the profile of the updated system to be implemented.

To ensure the effective monitoring of SMART CFBS, it is advisable to use surveys, preliminary testing, etc. For instance, surveys of employees in state financial control bodies can help create a comprehensive picture of the existing system and justify the feasibility and potential of introducing new digital technologies. The survey results provide insight into planned and actual costs for conducting analysis and forming conclusions, the availability or absence of staff motivation tools, the effectiveness of responsibility centers, and the qualification level of personnel who will subsequently work within the SMART CFBS framework.

Based on the results of the first stage, specialists determine the feasibility of implementing the SMART CFBS system, as well as the relevance and applicability of the selected concepts. Typical mistakes at this stage include the use of economically inefficient financial expenditures to maintain information platforms and the absence of objective justification for implementing the system.

The initial phase of the SMART CFBS implementation begins with the submission of an application for the development of the system. This process involves two parties: the functional customer and the technologist. The functional customer is responsible for submitting the application for SMART CFBS and identifying the integration needs with the existing information systems used by participants in the budgetary process. Upon reviewing the application, the technologist has seven working days to decide whether additional information is needed to supplement the content. If required, the functional customer must provide the missing information within five working days. Should the technologist require more detailed data on the existing information systems, the functional customer must also submit the requested materials within five days. The same procedure applies to other requests for supplementary information specified in the application.

After clarifying the content of the application, the technologist decides whether the application can be executed. In the case of a negative decision, the application is returned to the functional customer along with a justification for the refusal. If the application is approved, it undergoes a registration procedure and is forwarded for execution within the framework of the next implementation stage.

Stage 2 is preparatory. During this phase, the functional structure of the new information system is organized. This stage addresses the practical implementation of the proposed system and the legal and methodological procedures that regulate the actions performed during the rollout of SMART CFBS.

During the second stage of development and implementation, internal regulatory documents are drafted and approved concerning the formation of the functional structure of SMART CFBS. These documents define performance indicators of the system. Simultaneously, a security audit of the information system is carried out, including an assessment of data leakage risks and the possibility of unauthorized access. The outcomes of a successfully conducted preparatory stage include comprehensive legal and methodological support for the system and the approval of software solutions that meet all the identified requirements.

At the stage of developing the technical specifications for the SMART CFBS system, the following stakeholders are involved: the functional customer, the technologist, the responsible officer for operation, infrastructure, and architecture, the information security officer, and the head of the organization (a participant in the budget process).

This stage begins with the functional customer drafting the technical specification project for the SMART CFBS system, based in part on the input from the other participants involved in the project's creation. The technologist reviews the draft and provides proposals and comments regarding its feasibility and implementability. The responsible officer for operation, infrastructure, and architecture defines the system architecture requirements

and ensures that all technical conditions are met. This includes conditions related to information technologies and infrastructure readiness timelines for commissioning works and conducting testing and acceptance procedures. The information security officer verifies that the draft contains appropriate requirements for data protection and ensures that provisions for the legal significance of electronic document management are included. Once all parties have exchanged information, the technologist and the responsible officers must approve the draft technical specifications, after which the head of the organization formally approves it. The approval process takes place in two stages: a preliminary review (seven working days) and a final review (three working days). At either stage, the draft may be returned for revision. The final approval can take up to seven working days. Simultaneously, a system to prevent unauthorized access is developed and implemented.

The next stage involves the development of the technical specification for the SMART CFBS information security system and the drafting of the information security threat model. The information security officer is primarily responsible for this process. Their first task is to identify potential threats based on the approved technical specification and the information system classification report. Following the threat assessment, the information security officer determines whether it is necessary to develop a full information security threat model. Up to seven working days are allocated for this process, which may include requests for additional information from the technologist, the functional customer, and the responsible officer for operation, infrastructure, and architecture. Each party has up to five working days to fulfill such requests.

Once the draft threat model is prepared, it undergoes initial approval by the functional customer and the technologist within seven working days. If the draft is approved, it proceeds to the formal approval stage by the head of the organization. This final approval is accompanied by the creation of a data package, which includes coordination with federal executive authorities responsible for information security and protection. These authorities may recommend changes to the threat model, and a review period of up to 20 working days is provided for this step.

Stage 3 serves as the foundation for the entire system, focusing on developing tools to stabilize the SMART CFBS system within the broader framework of management processes. The main objective of this stage is to implement the core functions necessary to solve designated managerial tasks. At this point, mechanisms are configured for consolidating all types of information, establishing managerial accounting procedures, and creating financial responsibility centers. An internal document management system is also established, including electronic document workflows.

Once the information security threat model has been approved, work begins on drafting and signing a contract for the development of SMART CFBS. The functional customer first prepares a draft financial and economic justification, which is then reviewed and approved by the officer responsible for operation, infrastructure, and architecture. In addition to gathering the required information for drafting the contract, a data package is prepared to support the decision on whether the creation of SMART CFBS is feasible (a formal application with a request for information on existing information systems at the budget process participant’s disposal and their potential for integration; the financial and economic justification; documents concerning the protection of information stored in the system; and proposals for the development of an information security system).

The selected software is approved, custom program modules are developed, and integration with existing information systems is carried out. At this stage, the system is nearly ready for operation. A test launch is then conducted, during which specialists assess the system's functionality, evaluate the speed and responsiveness of operations, and monitor for any delays in data transmission. This stage concludes with the development, coordination, and approval of system documentation, as well as the implementation of SMART CFBS and user onboarding, during which access rights are granted to all the participants involved in the system.

At this stage, a training and education plan is also developed to prepare personnel for operating within the new environment. A schedule of seminars and training programs is approved to ensure that employees can work within the system efficiently and without downtime, minimizing errors and major disruptions that could impact the system’s performance. Specialists provide consultations to ensure a smooth onboarding process for employees in the new digital environment.

Stage 4 is the final stage, which includes the evaluation of the SMART CFBS implementation. The analysis conducted at this stage will help identify the system’s vulnerabilities and develop recommendations for further improvement.

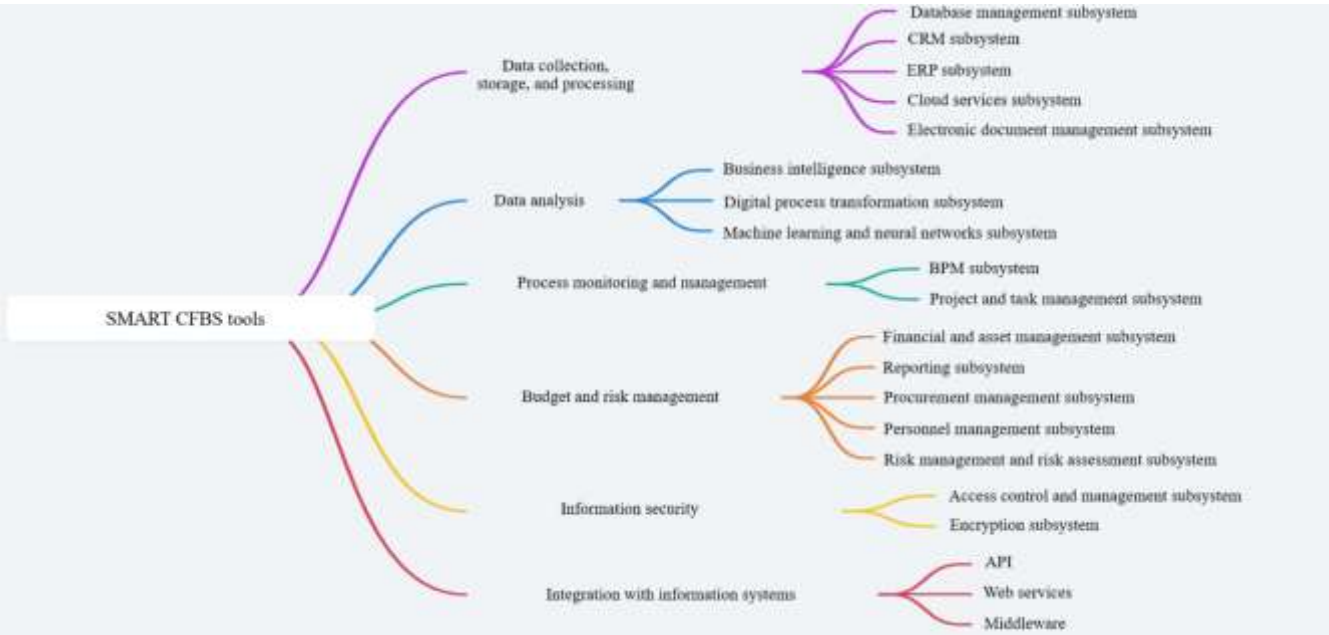
At this stage, the performance of the responsible departments is also assessed based on the analysis of strategic control indicators (Isaev et al., 2022). The stage is considered complete if, during its execution, all participants in the budget process have been integrated into the established SMART CFBS system. If there is well-founded justification, the scope of SMART CFBS may be expanded into other functional areas, provided that its tools and technologies are further refined. This stage may also reveal typical mistakes, such as the incorporation of contradictory methodological tools into the system, which are used across various functional fields. The final stage plays a crucial role in determining the impact of SMART CFBS on the implementation of all control methods in the financial and budgetary sphere.

These stages represent only the beginning of the SMART control system in the financial and budgetary sphere. If the analysis confirms the integration of control activities into the digital environment, the creation of a unified digital platform, the fine-tuning of real-time control mechanisms, and the establishment of an efficient electronic document flow for all users along the financial control chain (up to the final recipients of budget funds), it can be stated that the SMART CFBS system has been successfully established.

SMART CFBS constitutes a set of analytical and digital tools designed to predict risks and embed automated controllers into business processes. This approach enables the prevention of negative outcomes at the preliminary control stage, thereby continuously improving the efficiency and effectiveness of oversight.

Figure 4 illustrates the grouping of tools according to their respective areas of operation.

Figure 4 - SMART CFBS tools



Source: compiled by the authors.

SMART CFBS provides a full cycle of financial and budgetary process management. Its tools enable effective coordination of actions, eliminating errors and redundancy in operations.

The SMART control model in the financial and budgetary sector represents a comprehensive system that integrates functional zones and tools to ensure effective financial management within a budgetary organization. The tools supporting the main functional areas of SMART CFBS are as follows:

(1) Accounting support, which ensures the accuracy and timeliness of financial transaction records. Its primary objectives are the collection, storage, and processing of data to support effective managerial decision-making, as well as the maintenance of relationships with suppliers and contractors.

The functional area includes a database management subsystem that collects, stores, and processes information necessary for recording financial transactions, ensuring the reliability of databases, the ability to analyze data, and the generation of reports. One component of this subsystem is the CRM subsystem that facilitates the tracking of interactions with suppliers and contractors and the monitoring of the status of contracts and the timeliness of payments. It also includes an ERP subsystem, which ensures the integration of work processes such

as financial accounting, procurement, and human resources management. This subsystem enables centralized data management and the automation of routine operations, thereby reducing processing time. In addition, it incorporates an electronic document management subsystem that provides efficient document handling during financial operations.

(2) Human resources support contributes to effective personnel management, improved labor productivity, and the achievement of the organization's strategic goals. It includes a human resources management subsystem, which maintains records of employees, their qualifications, job responsibilities, and payroll data. The subsystem is designed for planning personnel needs, optimizing recruitment processes, and managing the formation of the payroll fund.

(3) Contract management support plays a critical role in ensuring the stable functioning of the organization and in managing contractual relationships with suppliers and contractors. This area includes a CRM subsystem aimed at organizing the tracking of interactions with counterparties and monitoring the status of contractual relations. It also comprises a procurement management subsystem, which enables the planning and regulation of the procurement process, the selection of optimal suppliers, and the reduction of procurement-related risks. In addition, this area incorporates a reporting subsystem that supports the preparation and analysis of reports on the organization's financial and budgetary activities, evaluates compliance with contractual obligations, and ensures adherence to financial standards.

(4) Audit support contributes to the transparency and reliability of financial processes through accurate and efficient data analysis, helping to mitigate financial risks. It includes a business analytics subsystem that automates audit processes, identifies potential risks, assesses the reliability of financial and budgetary operations, analyzes financial data, and detects deviations. This enables the identification of trends and the evaluation of business process efficiency to support effective management decision-making.

(5) Financial planning support plays a key role in achieving financial objectives, developing strategic plans, monitoring their implementation, optimizing expenditures, and improving the use of budgetary resources. It includes an ERP subsystem that ensures the development and monitoring of financial operations and the organization's budget, enabling the optimization of expenditures and the planning of revenue to achieve strategic goals. Furthermore, this area includes a financial and asset management subsystem responsible for planning and distributing the organization's financial resources and assets. It provides centralized budget management and ensures the efficient use of financial resources.

(6) Organizational and legal support is aimed at ensuring organizational efficiency. It includes a project and task management subsystem that facilitates the planning and coordination of financial processes and tasks, as well as monitoring their implementation in line with the goals set. It also contains a risk management and assessment subsystem, which supports the identification and mitigation of risks related to financial operations, the development of risk minimization strategies, and the oversight of the risk portfolio.

(7) Information support ensures access to up-to-date data on the organization's financial and budgetary activities. It facilitates effective user interaction with the system and enables seamless data exchange between its components. This functional area includes web services that provide users with access to current information and financial reports without needing to install additional software. It also encompasses middleware, which serves as the integration layer, enabling efficient data exchange and interoperability among the various subsystems and components of SMART CFBS.

The information support area includes an API essential for integrating external information systems and developing custom applications based on system data. The API provides standardized interfaces for system interaction and functional expansion. In addition, this area includes a Business Process Management (BPM) subsystem, which visualizes data and generates reports on financial and budgetary activities. This subsystem supports the analysis and monitoring of the organization's key performance indicators. Another key element is the access control and management subsystem for managing user permissions and controlling access to information and resources within the SMART CFBS system.

This subsystem performs employee authentication and authorization, as well as audits of access to system data. Another critical component is the encryption subsystem that ensures data confidentiality by encoding information during transmission and storage using modern cryptographic algorithms, protecting it from

unauthorized access and potential data breaches. A key element of information support is machine learning and neural networks.

In the current context of rapidly increasing volumes of information (facts, messages, data) within the financial and budgetary sphere, it is relevant to combine traditional analytical tools with machine learning models within the SMART CFBS system. This integration enables the system to assess the probability of budget discipline violations by entities subject to government financial control; evaluate the risk of misuse of budgetary funds; forecast budget revenues and expenditures; support budget monitoring within the treasury payment system; and automate processes associated with the exercise of powers by budget process participants.

The key stages of building such models include:

1. Problem formulation;
2. Data collection and preparation;
3. Data preprocessing (training and test datasets);
4. Algorithm selection;
5. Model performance evaluation;
6. Model validation;
7. Deployment of the model into production;
8. Monitoring and quality control of the algorithm's performance.

To define the tasks to be addressed through AI within the SMART CFBS framework, it is necessary to compile a list of potential areas for business process optimization. After evaluating and prioritizing the proposed initiatives, an implementation plan is developed. Machine learning distinguishes several types of tasks, such as regression, classification, clustering, etc. Regression refers to a task that predicts numerical values based on large historical datasets. Classification involves assigning research objects to one of several predefined categories. Clustering groups a dataset into clusters based on similarities, with clusters being determined by the model itself rather than being predefined. As an example, let us consider the task of identifying institutions with a high probability of committing violations of budgetary discipline. This type of task falls under the classification category.

The next stage involves collecting and preparing big data in the budgetary sphere, i.e., the entire volume of information (data and messages) in electronic form from various sources related to the selected task. This stage includes data assessment and cleansing, which encompasses data structuring, formatting (e.g., standardizing date and number formats), and error correction. Since machine learning models are trained solely on historical data (from previous periods), it becomes necessary to perform data augmentation, defining the procedure for incorporating new data as the developed model is used. Moreover, a list of potential new data sources that may emerge after the model's deployment is compiled to enable further retraining based on this new information.

The data preprocessing stage involves preparing the data for training and testing the machine learning model based on the chosen validation method. Under the hold-out strategy, all data is split into two sets: training and testing. The training set is used to train the model and identify possible errors in its operation. The testing set is not used during training and is reserved for evaluating the machine learning model just before deployment. This data splitting can be performed by year. For example, the training set may include all messages, data, and information related to the characteristics of institutions that violated budgetary discipline during 2020-2021, while the test set may cover the period from 2022 to 2023.

The selection of an algorithm begins with an analysis of the available data, which includes identifying key features that will be used to solve the task during the model's deployment. This stage involves developing several baseline models based on the training dataset. Each baseline model can be designed to target a specific feature by which a potential violation will be predicted. Not all these models may function correctly, so quality evaluation is essential. At the prototype development stage, it is also possible to assess the potential economic impact and estimate the total cost of implementing the machine learning model.

Quality assessment is based on the developed libraries of proxy metrics for evaluating violations of budgetary discipline. A proxy metric is understood as a key indicator of the analyzed object. This stage involves identifying errors and refining baseline models by correcting the detected issues, improving individual models, and optimizing their parameters. This process enables the specification of features and the selection of an appropriate validation method (cross-validation, holdout strategy, or evaluation of quality metrics).

Model validation involves assessing the quality and performance of the model. This stage concludes with integrating baseline models into a single machine learning model, which performs the designated task and generates predictions.

The deployment of a machine learning model into an operational process refers to the stage of integrating the model into the existing information system. During this period, additional requirements are gathered, and pilot industrial operation is carried out.

Quality control of the algorithm's performance involves maintaining the model's functionality as new data from internal and external sources becomes available. This stage also includes refining the solution in cases where performance metrics decline and identifying new optimization opportunities during the model's application. For example, changes in regulatory requirements for budget discipline compliance or administrative reforms that alter the scope of entities subject to government financial oversight.

The development, piloting, implementation, and monitoring of machine learning models require the involvement of professionals. Therefore, it is necessary to take organizational and staffing measures within government financial control bodies. First and foremost, this involves establishing dedicated units or incorporating specialized positions in data science into staffing schedules (big data analysts, developers, and data engineers) to organize the work of systematizing predictive models, conducting analytics, and implementing data visualization (including dashboard design).

Applying neural networks in financial and budgetary control primarily involves large language models. Configuring GPT-based chatbots for interaction between government financial control bodies and entities under supervision would enable communications automation. When selecting GPT systems, it is essential to consider the need to ensure the state's information security, thus favoring domestic solutions, including YandexGPT or GigaChat (a product within the Sber ecosystem).

To summarize, the following key areas for the use of this subsystem can be outlined:

– Automated data processing that enables the analysis of large volumes of information, the detection of anomalous transactions, and the identification of potential fraud cases;

– Risk forecasting and analysis based on historical data, as well as the identification of trends that may indicate emerging risks;

– Optimization of data collection, processing, and analysis workflows, along with the development of machine learning models aimed at identifying problems and shortcomings in the administrative operations of institutions;

– Development of chatbots and virtual assistants, which can enhance the level of communication;

– Implementation of personalized continuous learning trajectories for employees tailored to the specifics of institutional activities and based on recommendations generated by neural networks.

(8) Specialized functional support plays a crucial role in adapting SMART CFBS to the specific needs and operational characteristics of all participants in the budgetary process.

It includes a cloud services subsystem that provides access to the system's functionality via the Internet. This allows users to remotely access the system from any location and device and facilitates the adaptation of SMART CFBS in various organizations. The zone also incorporates a digital transformation subsystem, enhancing organizational efficiency and competitiveness in the digital economy. This subsystem enables the automation of routine processes related to the management of financial operations and budgetary funds, introducing innovative technologies and methodologies to optimize business processes.

When selecting tools, it is essential to consider factors, including usability, functionality, security, and availability of relevant resources. As a rule, such tools help organizations make informed decisions, optimize budget and financial management processes, improve staff performance, and ensure effective control. The selection of specific tools for system implementation depends on the unique characteristics and needs of the organization, as well as the resources available to it. The interconnection between functional tool areas allows tracing coordination across various operational tasks.

For example, subsystems for data collection, storage, and processing often serve as primary sources of information for analytical tools. Monitoring and process management tools are closely linked to these analytical instruments and are intended to optimize workflows. Budgeting and risk management tools rely on data from other subsystems for effective planning and forecasting. Information security tools are required at every stage, from data

collection to analysis and storage. Importantly, all subsystems must be mutually compatible and capable of integration to ensure the maximum efficiency of the SMART CFBS system.

Each functional zone and its corresponding tools play a critical role in ensuring the transparency, efficiency, and reliability of management processes, thereby contributing to the achievement of an organization's strategic goals and supporting the sustainable development of the state.

3 DISCUSSION

Bovaird & Löffler (2016) explored issues related to quality management in public sector organizations. The digital transformation of public administration has been the focus of research by Mergel (2019) and Scupola and Mergel (2022). These authors emphasize the advisability of implementing digitalization processes in stages (planning, design, management, implementation, and evaluation of the effectiveness of each stage), which aligns well with the implementation phases of our proposed SMART CFBS model.

The readiness of public institutions to adopt and utilize AI was examined by Ahn and Chen (2022). They highlight the importance of training civil servants in AI to improve their understanding and acceptance of innovations and the potential of AI in public administration. The results of these studies are consistent with our view that training public officials in AI is essential. We also agree that AI will help foster a culture of innovation necessary for a sustainable and effective digital transformation of public administration.

The complexity of digitalizing public services in federal states is emphasized by Scholta (2024). The authors justify their position by noting that a federal structure implies a division of powers and clearly defined jurisdictions among various public sector entities, while digitalization promotes interaction between society and its institutions. We concur with their conclusion that the multitude of actors involved in delivering digital public services in federal systems requires centralized coordination. The model of digital public financial control proposed in our study represents an element of such centralized coordination within public administration.

Xu et al. (2025) explore the mechanism by which digital tax administration influences corporate innovation, emphasizing that it stimulates innovation by easing financial constraints. Our research builds upon this conclusion by recommending that the SMART financial and budgetary control model should also include state-owned commercial enterprises. One of the prerequisites for comprehensive digitalization is achieving a sufficient level of digital maturity across all economic entities in the public sector.

The study by Lee et al. (2024) is based on the understanding that the potential of digital technologies drives digital transformation and the creation of public value primarily by enhancing information exchange and collaboration. We fully agree with the authors' conclusions that digital technologies contribute significantly to the efficiency of public administration.

CONCLUSION

Digitalization has become both a challenge and a catalyst for a new stage in the development of public administration and the financial and budgetary control system. However, the implementation of innovative objectives within the system of state financial control will occur under conditions characterized by the establishment of a transparent mechanism for achieving sustainable development goals, the creation of a control environment incorporating AI, and the formation of a unified digital space to ensure comprehensive interaction among all participants in the budget process. In this context, the study proposes a digital advancement of innovative methods for internal state financial control within the information field of the public administration system of Russia. Our central idea is the development of a SMART control model in the financial and budgetary sphere as a subsystem of a unified electronic environment for automated controlling, analysis, and accounting of public finances, planned for implementation in 2027. This environment is intended for use by state (municipal) authorities and public sector organizations to improve the efficiency and quality of managerial decision-making. The model includes implementation stages, tools, and functional areas and outlines their interaction and interconnection during operation. It is expected to enhance the efficiency and quality of processes conducted by bodies of state financial control and other participants in the budgetary process, while also ensuring effective coordination among them.

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