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Forecast of the Digitalization Impact on Public Financial Management

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ABSTRACT

Modern digital technologies based on artificial intelligence and big data have a significant impact on many areas of the socio-economic life of society. At present, digitalization has not affected the public financial management system to a small extent. However, this particular area has a high potential for the use of big data and artificial intelligence, as it is based on significant amounts of information, including unstructured information. At the same time, the process, mechanism and forms of the digital technologies impact on public finance management have been little studied in the scientific literature. The paper forecasts changing in the public financial management system that may occur under the influence of digital technologies in the medium and long term. The authors used a methodical approach based on extrapolation for forecasting. Nowadays, digital technologies have significantly influenced some sectors of the socio-economic people's activity. The forms and mechanisms of such influence had been extrapolated to the public financial management system and, primarily, to various stages of the budget process.

Keywords: artificial intelligence; digital technologies; budgeting process; public finance management; budget planning; budget approval; budget execution; state procurements; new public management

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INTRODUCTION

Digital technology is having a significant impact on people's social and economic conditions: technology is changing (industrial robots are seen as real competitors for jobs), business (internet companies have become global economic leaders), finance (banks have emerged that do not have a single office to serve customers), social connections (they are increasingly moving to the internet). And only one sector is being bypassed by twenty-first century trends — the public finance sector. The budget system of Russia, and other countries, was formed decades ago and continues to live by the canons of the 20th century.

Many problems have accumulated in the budget system that cannot be solved by traditional methods, without extensive use of digital technology and artificial intelligence. Such problems exist at all stages of the budgeting process. At the planning stage for many public-legal entities there is a question of conformity of the budget structure to the structure of citizens' needs, the calculation of which is complicated by the availability of a variety of information, the processing of which is possible only with the use of artificial intelligence tools. In the budget execution process, the biggest problems arise in the public procurement system. Their volume in value terms reached 8.9 trillion rubles in 2020.[1] At the same time, the supervisory and auditing authorities identified more than 83,000 violations of procurement rules worth RUB 362bn. It should be noted that not all government and government-controlled corporate procurements were audited. Every year in Russia, in accordance with the procurement legislation, almost 30 million contracts are signed, which the accounting bodies simply cannot check. This area requires not only the introduction of modern digital technologies, but also building the entire public procurement system based on the principles of artificial intelligence.

Many of the problems in managing public finances are caused by a lack of attention to and transparency of budget data. For example, in 2021, the amount of budget investments was 2,060 billion roubles — which is 60 billion roubles more than in 2020. However, another critical indicator is missing: how much budget investment is needed? Without this, it is impossible to assess the effectiveness of management decisions.

Modern digital technologies can significantly improve the quality of public finance management. It should be noted that the budget system is technologically fully suitable for the introduction of digital technologies and artificial intelligence: there is nothing complicated in budgets, everything is based on four arithmetic operations, but there are huge volumes of information. Its processing is currently fragmented into many disparate blocks (assigned to different people and departments), and only automated systems based on artificial intelligence are able to bring them together. It is most useful in automating dynamic processes that use large volumes of data, including unstructured data. The budget process is fully consistent with this characteristic.

OPEN BUDGETARY DATA

The world is gradually entering an information age of development, characterised by data-driven management.

There have not been many managerial eras in human history. Initially, management was based on physical force. Then it was based on experience, which was accumulated gradually and passed on from generation to

[1] Report on the results of the expert-analytical measure "Monitoring the Development of the Public and Corporate Procurement System in the Russian Federation in 2020". Accounts Chamber of the Russian Federation, 2021. URL: https://ach.gov.ru/upload/iblock/123/442w02xo0vq4unq199jwxnr9mpow972c.pdf (accessed on: 15.12.2021).

generation. Knowledge-based management became decisive with the Industrial Revolution in England. This era continues to this day. However, in many areas of human activity, it is being replaced by data-based management [1, 2]. It is happening most rapidly in technology. Industrial robots, driverless cars, etc. — are the result of digital technology and artificial intelligence. Data-driven active management is spreading in business. Digital technology and artificial intelligence systems have led to the creation of online commerce, online and mobile banking, implementation of enterprise resource management (ERP) systems, etc. Data-driven management is enshrined in modern national standards as one of the principles of quality management.[2]

Information is becoming the most important economic resource. The competitiveness of an economy depends on the ability to generate, process, and effectively use information. Whereas information used to be a cost item, it has now moved to an income item [3]. At the same time, the amount of publicly available data on the Internet is increasing rapidly. G8 leaders adopted the Open Data Charter in 2013.[3] The Open Data Charter, a key provision of which is the recognition that all public data, with the exception of sensitive data, should be open and publicly available by default, i.e., without any additional conditions.

The same applies to information on public finances. In almost all developed countries of the world, large amounts of budget information can be found in the public domain — usually in machine-readable formats. This is a consequence of the open budget policy of many countries and international organisations.

The topic of open budget data has been intensively discussed since the beginning of the 21st century. International organisations have been particularly active: Organisation for Economic Cooperation and Development (OECD), International Monetary Fund (IMF), World Bank Group, Global Initiative for Financial Transparency (GIFT), International Budget Partnership (IBP), etc. The above-mentioned institutions have developed fundamental documents in the area of budget openness.[4]

Let us consider the most common interpretation of budget openness as set out in one of the OECD policy documents.[5] Budget transparency is the timely and systematic full disclosure of all necessary fiscal information. It should ensure that public reporting on public finances is clear, complete, reliable, timely, accessible, and user-friendly, and that citizens can participate in the budget process. The benefits of budget transparency are increased accountability, legitimacy, integrity, inclusiveness, and high quality of budget decisions. All of these should ultimately contribute to building trust between governments and citizens. Thus, the main goal of fiscal openness is usually formulated as increasing the level of trust of citizens in government through its accountability to the public. This position is widespread and is supported by many experts and international organisations [4]. However, some economists note that the link between budget openness and government accountability to the public

[2] GOST R ISO 9000–2015. Quality management systems. Fundamentals and glossary. URL: https://docs.cntd.ru/document/1200124393 (accessed on: 20.12.2021).

[3] G8 Open Data Charter. URL: https://minfin.gov.ru/common/upload/library/2015/06/main/hartiya_otkrytyh_dannyh_gruppy_vosmi.pdf (accessed on: 12.12.2021).

[4] High-Level Principles on Fiscal Transparency, Participation and Accountability. GIFT. URL: https://www.fiscaltransparency.net/ft_principles/ (accessed on: 12.12.2021).

[5] OECD Budget Transparency Toolkit: Practical Steps for Supporting Openness, Integrity and Accountability in Public Financial Management. URL: https://www.oecd-ilibrary.org/docserver/9789264282070-en.pdf?expires=1669038458&id=id&accname=oid022141&checksum=D 997E 686C 7CD 34F133016D 7C 0E 305D 83 (accessed on: 12.12.2021).

is not direct and obvious [5, 6]. This is evidenced by the low popularity of the main tools of the authorities: budgets for citizens and public hearings on budgetary issues, where citizens are passive, which fully suits the authorities [7].

It seems that the point of budget openness is this: budget data provides the basis on which a more modern and efficient system of public financial management will be built. Currently, there are vast amounts of budget data in many countries that are very poorly used. If the tools of artificial intelligence and digital technology were applied to them, the efficiency of the public finance management system would be greatly improved. Many key elements of the system could be reformed, including all stages of the budget process. But before analysing potential innovations in public financial management, it is necessary to consider theoretical and methodological approaches to this issue.

THEORETICAL AND METHODOLOGICAL PREREQUISITES FOR THE DIGITALISATION OF THE BUDGET PROCESS

In recent decades, new scientific interpretations that differ from the classical ones have started to appear in the theory of governance (including public finance). This is, first of all, the concept of New Public Management (NPM), where the most important elements are client-orientation and an emphasis on the efficiency of public administration [8, 9]. Citizens are presented as customers who, in exchange for taxes, should receive services. To this end, they create the state; in the NPM theory, they are hired managers providing services to individuals and businesses.

In this paradigm, one of the most important tasks of public administration seems to be increasing the efficiency of public service delivery with limited resources: increasing the volume or improving the quality of services with a given amount of funding, or reducing the cost of providing services of a given volume and quality. From a practical point of view, it makes sense to compare the effectiveness of services in different sectors, using two abstract parameters: service supply, which describes the effect, and the cost of service, which describes the cost. These abstract parameters can be calculated, at least for social services. It should be noted that the issue of methodology for calculating the efficiency of public services requires a special study and is beyond the scope of this article.

Alternatives to public services need to be considered to make them more effective. For example, medicine can be public, private or insured. Education can be provided in a public, private, charter school or at home. In principle, both health care and school education could be organised without any state funding at all. But street lighting, road construction or maintenance of the army and police require public participation. For efficient service provision, competition is necessary, as it provides the impetus for development. In the public sector, a competitive environment can only be created where services are provided by institutions that are able to compete with each other and with non-state providers.

The New Public Management theory is based on open information, which is seen as the basis for managerial decisions by fiscal actors. The NPM concept has influenced economic policies called “Thatcherism” and “Reaganomics”. It is often criticised in the current economic literature. The main argument is that attempts to implement this theory in practice have not always yielded positive results. As a consequence, other theories of governance began to appear: The Neo-Weberian State (NWS) [10, 11], Digital Era Governance (DEG) [12], New Public Governance (NPG) [13, 14], New Public Service [15], Public Value Management etc. [16–18].

The first three concepts are most widely used.

NWS theory is based on the postulates of M. Weber's "ideal bureaucracy" (Weberian), supplemented by some modern elements, often coinciding with the provisions of NPM. Thus, supporters of NWS try to update the classical theory of bureaucracy to include the principle of customer focus. However, while for NPM it does not matter who provides services to the client, NWS draws a clear distinction between private and public organisations. Priority is clearly given to public service providers. Consequently, the issue of efficiency is secondary, and professional rules for service provision come first. Similar differences exist in the assessment of the role of citizens in public administration. The NPM tends towards direct democracy, the NWS concept focuses on the leadership role of the executive, while recognising the need for public consultation on a wide range of issues.

DEG theory was formed at the beginning of the 21st century. Naturally, it focuses on the use of digital technologies in public administration, especially e-government. However, by criticising the NPM concept, DEG failed to create a coherent methodological platform for public administration reforms and was not widely used in practice.

The concept of social-public (public and state) governance (NPG) has a more serious theoretical basis. It is based on the real existence of the state and civil society. The main task is seen in organising the interaction of these two most important public institutions in decision-making. A necessary element here is the involvement of citizens in public administration, e.g., in the form of public organisations. Efficiency is not supposed to be achieved by rigid methods of competition, but by interaction of civil society with the state, taking into account people's interest in socio-economic development.

Many elements of NPG theory are now being promoted by international organisations such as the World Bank or the International Monetary Fund. This is fully applicable to issues of public financial management, in particular to the problem of budget transparency — in this concept, it implies disclosure by public authorities for reviewing their plans, rather than for making management decisions. Clearly, the theoretical underpinning for fiscal openness discussed above is based precisely on the NPG concept.

When comparing modern concepts of public administration, it should be noted that they differ, among other things, in the degree of motivation to commit reforms in public finance regulation. The NPG assumes soft motivational incentives based on cooperation between the government and society. The NPM is based on hard incentives generated by competition. The latter approach seems to be more adequate to the changes that may be brought about by the widespread adoption of digital technologies and artificial intelligence mechanisms. Firstly, modern technologies often deal with fundamental issues of public finance management, which can far from being solved in an evolutionary way. Secondly, NPM theory focuses on improving governance efficiency. This approach becomes most relevant in times of crisis. Currently, some countries have a complicated situation with their public finances, the main indicator of which is the debt crisis generated by poor management of these finances. Many states spend more money than they earn. However, the growth of debt cannot continue indefinitely. Thirdly, a service orientation makes the most of modern digital technology. It is the services that provide the link to the budget and access to financial and economic indicators, such as cost and cost-effectiveness, necessary for sound management decisions.

Let us consider the main uses of digital technology at various stages of the budgeting process. Note again that these are hypotheses, some of which may not be confirmed or may

not be realised until the distant future.

BUDGET PLANNING

The effectiveness of public finance management depends to a large extent on the quality of budget planning. At present, budget planning is usually carried out by the financial authorities of the executive branch. Whereas ten years ago, only they had the necessary information to do so, today it is publicly available. Any specialist is able to make a forecast of the budget revenues, perhaps more accurately than the financial authority of the public entity. For budget expenditures, there is not yet enough information in the public domain for planning, but based on the rate of budget data availability, it can be expected that in 5–10 years it will be publicly available. All this creates a hypothetical possibility, firstly, of changing the subjects of budget planning and, secondly, of developing alternative, competing draft budgets of public authorities.

The possibility of development of alternative draft budgets to be considered and adopted on a competitive basis is a direct consequence of the trend towards greater openness of the required data. It appears that political parties may be interested in developing draft budgets by involving planners. The drafts will be based on the same data, but will have different approaches in terms of budget policy priorities, budget expenditure structure, attitude to public debt, etc. Competition in this case can improve the quality of planning, as well as encourage developers to use modern digital technology. The executive branch will concentrate on budget execution.

The budget competition system hypothesis is based on data openness, which has reached a high level in many countries. In principle, it is technically possible to establish such a system at present. In practice, however, two obstacles arise. The first is the need for a political decision. Naturally, a system of competitive draft budgets reduces the powers of the executive, and this is always a complex and painful issue. The second is the need to substantially modernise the entire budget legislation, which may take a long time.

APPROVAL OF THE BUDGET

At present, the budget is approved using the mechanisms of representative democracy. But referendums are labour-intensive and costly, so citizens elect their representatives (deputies) and they decide on the budget. This mechanism today has no alternatives, but there is a significant drawback, which has been repeatedly pointed out in the economic literature — deputies do not always express the interests of citizens, often pursuing their own political or economic goals [19, 20]. Recently, more and more researchers believe that representative democracy is in crisis [21, 22].

The rapid development of digital technology allows a different mechanism of budgetary approval. Already today, many citizens have smartphones that recognise their fingerprint. It is possible that other, more advanced methods of identification will soon be available. This makes it possible to hold referendums quickly and cheaply, including on budgetary issues. This practice is a mechanism of direct democracy rather than representative democracy, which also has a significant drawback: Under these conditions, the role of populism, especially in its modern form, dubbed “technopopulism”, is dramatically increasing [23, 24].

It is quite possible that some hybrid budget voting technologies could emerge to reduce the impact of populism. For example, the right to vote could be granted only to those citizens who have been trained on the subject of the budget and confirmed their knowledge in an examination (test). Public financial

management requires at least minimal knowledge, and full accessibility to it must be ensured. Political parties, for example, may be interested in training citizens for free. Thus, if a citizen wishes to participate in budgetary matters, he or she must spend his or her own time on training.

Transition from representative to direct democracy in budgetary decision-making is possible in the medium term but requires much preparation.

BUDGETARY IMPLEMENTATION

Most of the functions performed by federal and regional treasuries are currently automated. However, the level of automation could be increased by artificial intelligence mechanisms. Of greatest relevance is the treasury's activity on preliminary and current control over the conduct of operations with the funds of the budgets of public-law entities. This is a task for the near future.

In banking, the use of artificial intelligence is proceeding at a rapid pace. Some banks, such as Tinkoff, are likely to be IT companies performing banking operations. The consequence of AI is a significant reduction in staff at banking institutions, especially middle-skilled staff. It can be assumed that in a short time treasuries serving budgets will also be downsized and will resemble IT departments in the structure of financial authorities.

A large segment of the economy is public procurement. Every year around the world, public authorities purchase some $ 9.5 trillion USD worth of goods and services from private businesses.[6] In the Russian Federation, public procurement has accounted for about 30% of GDP in recent years.[7] The public procurement system raises many criticisms (including those raised by the Russian Audit Chamber) due to the ambiguity of the conceptual approaches to its formation. The effectiveness of public procurement is often assessed by the level of competition among suppliers of goods and services in tenders. For example, the Audit Chamber of the Russian Federation considers a low level of competition among suppliers to be one of the main reasons for inefficiency of public procurement.[8] Thus, it is considered normal to hold a tender or auction for each procurement in which the supplier offering the best conditions is determined.

A different interpretation is given by GOST R ISO 9000–2015 "Quality management systems. Basic Provisions and Glossary". It recommends that relationships with suppliers should be "based on a balance of short-term benefits and long-term cooperation".[9] The current contractual system clearly prioritises short-term benefits, but it is only in the case of long-term co-operation that the supplier knows the buyer's needs well and adapts to them. The priority of short-term benefits reduces the efficiency of the budget system, but it is largely due to the desire to reduce corruption in procurement.

Artificial intelligence is able to create a system that focuses not only on short-term but also long-term cooperation, while keeping corruption risks to a minimum. By analysing large amounts of unstructured information, it can identify inefficient ones

[6] Why Modern, Fair and Open Public Procurement Systems Matter for the Private Sector in Developing Countries. The World Bank. URL: https://www.worldbank.org/en/news/feature/2018/05/16/why-modern-fair-and-open-public-procurement-systems-matter-for-developing-countries (accessed on: 04.02.2022).

[7] Accounts Chamber of the Russian Federation. Openness of the state in Russia. URL: https://ach.gov.ru/page/government-openness (accessed on: 14.02.2022).

[8] Accounts Chamber of the Russian Federation. Report on the results of the expert and analytical event "Monitoring the Development of the Public and Corporate Procurement System in the Russian Federation for 2018". URL: https://ach.gov.ru/upload/iblock/613/613a1b40adc5ed005bbb804fc17c8db0.pdf (accessed on: 14.12.2021).

[9] GOST R ISO 9000–2015 'Quality management systems. Main provisions and glossary". URL: https://docs.cntd.ru/document/1200124393 (accessed on: 23.10.2021).

even before the procurement announcement stage. The use of artificial intelligence can help to achieve the necessary balance between short-term benefits and long-term cooperation by:

- collecting data on possible suppliers;
- identifying anomalies in tender documents or prices;
- analysing contract performance risks;
- the use of various applications, e.g., chatbots facilitating tender procedures.

The problem of using artificial intelligence in public procurement is well covered in the scientific literature [25]. In some countries, its individual elements are beginning to be introduced in practice.[10]

As a result, it can be predicted that as the use of artificial intelligence tools in OTC ("over-the-counter") public procurement increases, there will be a gradual shift from competitive sourcing to long-term contracts.

MONITORING AND REPORTING

The control bodies (control and audit chambers) today cannot cope with the amount of information that makes sense to check, and identify violations that have already been committed — those that cannot always be corrected. This is one of the areas where the use of artificial intelligence is most appropriate and can have a significant effect. Moreover, work in this area has been ongoing for several years [26].

Artificial intelligence is capable of taking over the control over the targeted and efficient use of budgetary funds and many other functions performed by control and accounting bodies. At that, the audit could be carried out on a continuous basis, not once in several years, as it happens today. In addition, artificial intelligence would be able not only to audit budget execution reports, but also to generate most of them. This would allow these bodies to concentrate on methodological issues.

FLEXIBLE TAXATION SYSTEM

In any country's tax system, there are problematic aspects associated with the desire to minimise taxes by economic actors. This includes the most developed countries. For example, as a result of misreporting, Great Britain underreceives 6% of taxes, and every third taxpayer who files a tax return understates his/her income [27]. However, it is believed that the tax evasion situation in the UK is much better than in other developed countries such as the US or Canada. There is no doubt that digital technology and artificial intelligence can improve the control of tax collection, which is already being used in global practice.

The motivation of taxpayers is of great importance in the tax system. These issues have been studied in some detail, including the observation that the higher the level of citizen involvement in public administration, the lower the degree of tax evasion [28]. Good quality budget automation and the use of artificial intelligence tools increase taxpayer involvement in the management of public finances. This can be achieved by allowing citizens to choose for which purposes their taxes are allocated. Potentially, an individual could be given the right to determine where their income tax will be allocated in the planning year: for school education, landscaping, culture, or the environment; to authorities (sectors) or even to institutions (e.g., a specific school).

This way of involving citizens in the budget process could, firstly, improve tax collection (and also increase taxpayers' control over the efficient use of budget funds), and secondly, increase competition among recipients of budget funds for taxpayers' money. This would require them to disclose as much information about their activities as possible, to prove the

[10] URL: https://sievo.com/resources/ai-in-procurement (accessed on: 14.02.2022).

efficient use of funds, and to introduce new advanced technologies.

Therefore, there is the potential to increase the level of democratisation of the tax system in order to manage public finances efficiently. However, the foreseeable mechanism also has the disadvantage of making fiscal equalisation and balancing of budgets much more difficult. Artificial intelligence and automation can solve this problem.

At present, there is some analogue of the system in question. In the Canadian province of Alberta, citizens belonging to Catholic and Protestant denominations have the right to determine the direction of their property taxes, which are used to fund school education.[11] They can direct their tax to the Alberta School Fund, which distributes the budget to the institutions. But there is another option. Catholics, for example, have the right to direct their tax dollars not to the general fund, but specifically to fund Catholic schools. To do so, you simply have to submit an application to your school district. Protestants have a similar right. This system acts as a moral incentive for taxpayers, as the provincial government further equalises the funding of schools and school districts.

CONCLUSIONS

The impact of digital technology, artificial intelligence and data openness on public administration is only just beginning to be studied in economic science. Even in a country as advanced as the UK in its digitalisation of public administration practices, the first attempts to use artificial intelligence are only being made, and so far, in the simplest forms. However, given the dynamics of digitalisation in the business sector of economics, rapid and dramatic changes in public financial management are to be expected.

Two important factors can be noted that accelerate the introduction of artificial intelligence and digital technologies in public finance management. Firstly, it is the availability of modern theoretical and methodological developments of the last decades, such as NPM and others. Secondly, the high level of openness of budget data in many countries.

However, despite the availability of vast amounts of budget information, accounting, tax and statistical data, there is a real challenge in the public sector to ensure the quality and reliability of the data. To address this issue requires the commitment of the authorities and the recipients of budgetary funds to ensure the completeness and accuracy of the information. The current budget system often encourages the manipulation of data in order to give a favourable impression to superiors or voters. Information from different authorities does not always coincide, as they usually compete for limited financial resources to the detriment of cooperation. In addition, management accounting is almost entirely absent from the budgetary sphere, which makes it impossible to assess the effectiveness of the budget and its individual elements. This problem will only increase as digital technology is introduced.

All this shows that improving the budgeting process is an elaborate and complex problem. Artificial intelligence and digital technologies are important tools for improving the efficiency of public finance management.

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