EXECUTIVE SUMMARY
Study for the CONT committee

European Parliament

The future of digitalisation in budgetary control

Abstract

This study, commissioned by the European Parliament's Committee on Budgetary Control, explores new technological developments that are being or could be applied in the field of budgetary control and how these could be used to enhance the prevention of fraud and corruption and ensure sound financial management of EU funds. New technological developments covered by the study include big data analytics, artificial intelligence, digital platforms, robotic process automation, distributed ledger technologies (blockchain) and satellite imagery.

Introduction

This study has explored recent new technological developments in budgetary control, what new developments can be expected and how these could be used to protect the EU's budget by preventing fraud and ensuring sound financial management. New technologies include AI-powered systems, machine learning, large language models, big data, and robotic process automation. The study has assessed the advantages and limitations of these technologies, as well as factors (including data privacy, legal requirements, technical and cost issues) that facilitate or hinder their uptake and successful use for EU funds under different management modes.

The findings in this study draw on evidence from a review of literature and websites, interviews of EU bodies (European Commission, European Anti-Fraud Office, European Public Prosecutor's Office), a survey of public budgetary authorities which attracted 75 responses, and interviews of 39 national and regional authorities, universities and NGOs. The study particularly focused on technologies used at EU level and in a sample of eight EU Member States (Czechia, Germany, Hungary, Italy, Poland, Portugal, Romania, Sweden) and two non-EU countries (UK, USA).

Context for digitalisation in budgetary control

The misuse of EU funds remains a serious problem, with Member States reporting a total of 12,455 irregularities, amounting to EUR 1.77 billion, in 2022.[1] In this context, budgetary authorities have increasingly used new digital technologies to protect the EU budget. For example, digital tools operated by the European Commission help identify risks of irregularities:

- Arachne is a risk-scoring tool used by managing authorities (MAs) on a voluntary basis to detect risks of fraud and irregularities in the use of European Structural and Investment Funds. By combining data from MAs with data about companies, politically exposed persons and sanction lists, Arachne computes risks such as bankruptcy, criminal convictions or conflicts of interest. However, Arachne is limited by low awareness of the tool, privacy concerns, a high administrative burden, limited accessibility, inaccurate risk scores, and a high number of false positives.

[1] OLAF PIF Report 2022, section 4.1.

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- The Early Detection and Exclusion System (EDES) is a database allowing EU bodies to flag financial risks posed by (potential) recipients of EU funds. The EDES currently has limited reach, given that it does not apply to funds under shared management. However, the proposed new Financial Regulation includes a targeted extension to all management modes from 2028. In addition, a new web service would allow for fast checks of any economic operator.
- The Irregularity Management System (IMS) is a database within which Member States report irregularities in the management of EU funds. The IMS is valued by those MAs that use it but its utility is limited by the substantial variation in reporting practices across Member States.

New technologies currently used in budgetary control

New technologies currently used to improve budgetary control practices include big data analytics, artificial intelligence (AI), machine learning (ML), natural language processing (NLP), deep learning (DL), large language models (LLMs), robotic process automation (RPA), blockchain, and satellite imagery. Many of these technologies are inter-connected.

Some of the most important technological developments in budgetary control are in the field of AI. AI is a broad term that refers to the science of teaching machines to mimic human intelligence and perform human cognitive functions like problem-solving and learning. Machine learning, natural language processing, deep learning and large language models technologies are subfields of AI that leverage and build upon each other.

- ML is a core subfield of AI and is referred to as predictive modelling. Its purpose is to teach machines to learn from data, to describe data, to identify patterns and to make predictions based on data. ML is dependent on human intervention to teach a computer to perform tasks.
- DL is a powerful subset of ML and requires less human intervention. It uses neural networks, inspired by the human brain, to learn from data and improve the accuracy of their predictions.
- NLP is another subfield of AI that teaches computers to process language, 'understand', and generate human language. NLP uses different statistical, ML and DL models.
- LLMs are large DL neural networks that can perform a variety of tasks, including NLP tasks, such as translating text from one language to another, or answering questions.

AI-powered tools are used to protect public funds and help auditors and public procurement officers manage large volumes of data effectively, and can reduce the risk of manual errors and allow budgetary authorities to focus on higher-value tasks. On the other hand, developing AI-powered tools takes time and is costly. In addition, they may not be able to capture new indicators of fraud that have not been defined based on auditors' experience, and may generate false positives.

The main applications of AI technologies are in information management and risk-scoring.

AI-powered information management tools can help managing and audit authorities save time by outsourcing text processing tasks to computers. Platforms using LLMs allow organisations to process large bodies of complex data and text and to retrieve relevant information instantly, without investing staff time in undertaking such tasks manually.

AI-powered risk scoring tools can help protect public funds by detecting risks of fraud and alerting relevant authorities to contracts that may contain irregularities. In fact, in recent years, civil society organisations (CSOs) and non-governmental organisations (NGOs) in Central and Eastern Europe have developed tools that use machine learning technologies to uncover corruption in public procurement. Risk-scoring tools in EU audit institutions are still in development; however, they have great potential. For

instance, auditors in Belgium, Norway, Portugal, Spain and Sweden are developing tools that will use ML technology to find indications of fraud in large documents of audit data and explore ways to potentially move away from a sample-based auditing process to a 100% AI check. Evidence from the United States confirms this potential. In two state-level audit institutions consulted for this project – Massachusetts and New York – AI-powered risk scoring tools are already in use.

RPA is another new technology used to increase the efficiency of budgetary control. Contrary to AI based technologies, RPA is not used for predictive analytics and insight generation (i.e. to uncover irregularities and fraud). The aim of RPA is to automate tasks that are repetitive, rule-based and require a high degree of accuracy, thus allowing the audit teams to focus on higher-value or more complex tasks. Leveraging RPA technology can help institutions within the public sector to make rapid and effective improvements without a complete system overhaul, and to meet strict deadlines and respond more quickly.

RPA and AI sub-fields are complementary technologies that can work together to improve operational efficiency and enhance the quality of data-driven budgetary control. AI can help RPA automate tasks more fully, handle more complex data, and find patterns in data or extract meaning from images, text or speech. In turn, RPA can enable AI insights to be actioned faster without having to wait for manual implementations.

Both AI technologies and RPA can significantly enhance the capabilities, efficiency, and user experience of digital platforms.

Digital platforms are an effective and efficient tool for information and knowledge sharing, development of joint initiatives, and harmonised approaches to auditing and control, which can enhance the efficiency, speed, accuracy, and quality of budgetary control, as well as fraud detection activities. However, the recent uptake of digital platforms raises concerns about data privacy, especially in light of the European Court of Justice case law of 22 November 2022,[2] which emphasises the need to balance transparency in processing personal data in financial dealings with the protection of individual (i.e. beneficial owner) privacy rights.

Blockchain is a distributed ledger or a record of encrypted data and transactions that is duplicated and shared across a network of computers. In some ways, blockchain and digital platforms serve the same purpose, namely storing information. The main differences concern the number of places the data is stored, the number of entities involved in verifying it, and the way new data is entered. Data on digital platforms is generally stored in one place (disregarding backup sites), whereas data stored in a blockchain is stored in many places. The data on a digital platform is generally verified by one entity (aside from auditors), whereas the data in a blockchain is verified by all entities that are part of the network. While blockchain is not yet widely used in budgetary control, there are pilot projects to curb corruption in public procurement, e.g. in Brazil, Columbia, Nigeria, Peru, Rwanda and South Africa.

Satellite imagery is widely used in budgetary control. The EU's Copernicus Sentinel satellites support budgetary control through the provision of frequent and high-resolution images and data to paying agencies within the Common Agricultural Policy (CAP). The Sentinel images and data allow them to identify specific crops and monitor action such as harvesting with very high levels of precision. The continual evolution of satellite imaging together with the use of AI have the potential to transform multiple EU monitoring and budgetary control systems.

Possible future developments

Looking ahead, two technological developments offer particular promise for budgetary control.

Blockchain: the EU could develop a private and permissioned grant management and/or public procurement system based on blockchain technology. Such a system would record every procurement or

[2] Vistra (2023),"ECJ ruling on access to beneficial ownership information: Balancing transparency and privacy"

grant transaction in multiple places, making it very difficult for any one operator to use EU funds in ways that are not intended, thus increasing transparency, accountability, efficiency in contract management, and trust in the process. At the national level, national authorities could use blockchain to back up citizens' digital tax files, thus making taxable transactions and ownership of assets transparent and traceable. However, the wider application of blockchain technologies in budgetary control would have to overcome challenges including high set-up costs, data protection concerns and high energy consumption.

AI: AI could be used to simplify public procurement processes, for example through new contract management tools. ML algorithms could be used to calculate risk scores in large sets of data and could include an internal chatbot allowing auditors to ask questions about any audit files and be pointed to the relevant file, enabling them to fact-check the chatbot's answer in a matter of minutes. However, wider application of AI in budgetary control will have to overcome the risk of high levels of inaccuracy in the output of LLMs, high energy consumption and limited scalability.

Potential applications of new technologies

Evidence from the research carried out for this study suggests potential ways in which big data and new technologies can improve the management, control and auditing of EU expenditure and strengthen the prevention and detection of fraud and misuse of EU funds.

- Big data analytics and data mining: can facilitate access to data, risk-scoring, interoperability between institutions and harmonised data collection, verification and analysis.
- Machine learning: can enhance risk-scoring, strengthen prevention and detection of irregularities, identify weaknesses in control systems, and increase understanding of factors causing anomalies.
- Generative AI/LLMs: can allow for the summarising of large datasets, automatically correct, standardise and organised data, allow cross-referencing against other sources, and generate written reports.
- Robotic process automation: can enable web-scraping for data extraction, verification and reporting, and automate repetitive or time-consuming tasks.
- Digital Platforms: can facilitate the sharing of knowledge and verification of results between authorities.
- Blockchain: can enable the traceability and identification of transactions, streamline data collection and storage, and facilitate efforts to combat tax fraud (including cross-border).
- Satellite imagery can verify the quantity and quality of agricultural output funded by the CAP funds and detect anomalies.

Conclusions and recommendations

The misuse of EU funds poses a serious threat to the EU's ability to advance its strategic priorities and maintain public confidence in the EU. To address this, digitalisation is at the heart of the strategic vision of the European Commission and other bodies responsible for management and control of EU expenditure. EU-level IT tools, such as Arachne, EDES and IMS, are helping to protect the EU budget, but there is scope for further application of digital technologies.

Recommendation 1: Continue to enhance existing EU tools for budgetary control. This includes expanding Arachne to all management modes, integrating advanced technologies, ensuring interoperability with other tools, addressing privacy concerns, and enabling faster checking of operators against more up-to-date and comprehensive data cases. The IMS could be improved by introducing consistent thresholds for reporting cases of fraud and providing more up-to-date information.

Recommendation 2: Promote awareness of and training in the use of existing EU tools for budgetary control. For Arachne, this would relate to how the tool works, how to use it and how to use all the different functionalities, i.e. going beyond conflicts of interest and fraud red flags. For the IMS, this might include training in thresholds for reporting cases of 'suspected' and 'established' fraud.

Recommendation 3: Consider making the use of EU tools mandatory. In the case of Arachne, the Parliament, the Council and the Commission have committed to examining and re-discussing the compulsory use of the tool during the post-2027 multiannual financial framework.

New data-driven technologies such as data-mining, machine learning, robotic process automation and artificial intelligence could increase the efficiency and quality of budgetary control. AI and machine learning algorithms are proving accurate in detecting potential risk or cases of fraudulent spending and corruption. Machine learning can also be used to automate checks on operations in public procurement and for real-time monitoring of spending.

Recommendation 4: The EU and its Member States could consider pilot projects to explore the possibilities for applying new data-driven technologies to budgetary control. Such projects might be best developed on a transnational basis from the outset to ensure their applicability to different national contexts and to ensure a degree of consistency in the use of EU funds across the EU-27. Where appropriate, there may be possibilities for such pilots to be co-financed by relevant EU funding programmes.

To date, there has not been a broad and consistent deployment of data-driven technologies in budgetary control across the EU due to differences in national control strategies and systems, regulatory frameworks, investment capacity, digital competences and political priorities between Member States.

Recommendation 5: Support mutual learning, the sharing of good practices and exchanges of information between relevant authorities. Widening knowledge of good practice might help and inspire budgetary authorities to adopt new tools or configure themselves in such a way as to best exploit new technologies. More consistent adoption of new data-driven technologies might also support the harmonisation of control practices and standardisation of reporting methods.

Challenges in the use of new technologies include the need for uniform data collection, interoperability of data and systems, cost, privacy regulation compliance, ethical concerns relating to biases embedded in AI systems and a high number of false positives.

Recommendation 6: The EU could consider defining common standards for the use of new technologies in budgetary control accompanied by a code of conduct for the proper and 'fair' deployment of these technologies for budgetary control.

Recommendation 7: Assess the costs and benefits before deploying new technologies. In some cases, the deployment of new technologies can be expensive and the benefits uncertain, particularly where error rates are already low. Budgetary authorities should thus carefully assess the potential benefits of deploying new technologies relative to their cost. In some cases, it might be appropriate for ex ante impact assessment (including cost-benefit analysis) to be undertaken at EU level in respect of the possible deployment of new technologies at EU level (or across all Member States). Mutual learning and exchange of experience could inform this process.

Recommendation 8: Carry out regular "horizon scanning" to identify potential new technological developments suited for application to budgetary control and share information about such developments with budgetary authorities at EU level and in the Member States.

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