

Public Money & Management

ISSN: 0954-0962 (Print) 1467-9302 (Online) Journal homepage: www.tandfonline.com/journals/rpmm20

Data science and public sector accounting: Reviewing impacts on reporting, auditing, and accountability practices

Deborah Agostino, Rui Lourenço, Susana Jorge, Enrico Bracci & Isabel Cruz

To cite this article: Deborah Agostino, Rui Lourenço, Susana Jorge, Enrico Bracci & Isabel Cruz (21 Jul 2025): Data science and public sector accounting: Reviewing impacts on reporting, auditing, and accountability practices, Public Money & Management, DOI: 10.1080/09540962.2025.2529266

To link to this article: https://doi.org/10.1080/09540962.2025.2529266

© 2025 The Author(s). Published by Informa UK Limited, trading as Taylor & Francis Group

Published online: 21 Jul 2025.

Submit your article to this journal

Article views: 614

View related articles

View Crossmark data

Full Terms & Conditions of access and use can be found at
https://www.tandfonline.com/action/journalInformation?journalCode=rpmm20

PUBLIC MONEY & MANAGEMENT
https://doi.org/10.1080/09540962.2025.2529266

Routledge
Taylor & Francis Group

OPEN ACCESS Check for updates

Data science and public sector accounting: Reviewing impacts on reporting, auditing, and accountability practices

Deborah Agostino[a], Rui Lourenço[b], Susana Jorge [b], Enrico Bracci[c] and Isabel Cruz[b]

[a]Politecnico di Milano, Italy. deborah.agostino@polimi.it; [b]University of Coimbra, Portugal. ruiloure@fe.uc.pt, susjor@fe.uc.pt, isacruz@fe.uc.pt; [c]University of Ferrara, Italy. brcnrc@unife.it

IMPACT

This article highlights that while data preparers, auditors and final users of financial information in the public sector have been realizing the efficiency- and reliability-related benefits of data science tools, they may not be fully aware of the risks that may impact the transparency of financial documents and accountability-related processes. There is a very clear need to develop effective regulatory oversight mechanisms. The limited theoretical engagement of the literature reviewed in this article highlights the need for interdisciplinary approaches to conceptualizing data science and AI-driven financial reporting and decision-making.

ABSTRACT

This article provides a comprehensive review of the existing research on the use of algorithmic-based technologies, including artificial intelligence (AI) and machine learning, in public sector accounting, financial reporting, and auditing, deriving implications for the production and use of financial information, and accountability. There is a considerable shortage of research about data science on public sector financial information reporting, auditing and consequent accountability. Most studies lack theoretical background, focusing on the technical feasibility of data science applications, and presenting scarce empirical evidence on their organizational implications and on governance challenges. Future research should explore the ethical risks in financial management and reporting settings, accountability frameworks, and the evolving role of financial professionals in hybrid AI–human environments. Addressing these gaps will provide valuable insights into how data science can enhance—not undermine—public sector financial integrity, ensuring alignment with democratic values and governance principles.

KEYWORDS

Artificial intelligence; algorithms; decision-making; governance; public financial management; research trends

Introduction

Recent decades have witnessed a technological revolution driven by data science, encompassing advanced algorithms, artificial intelligence (AI), and machine learning (ML) (Provost & Fawcett, 2013; Wirtz et al., 2019; Straub et al., 2023). Data science can be defined as an interdisciplinary field that uses scientific methods, exploratory processes, algorithms and systems to extract knowledge and insights from data in various forms (Nadikattu, 2020). It combines statistics, data analysis and informatics to understand and analyse actual phenomena with data (Hayashi, 1998).

Data science has significantly impacted the life of citizens (Rabbani, 2024), as well as public sector entities and governments (Bullock et al., 2020; Jiménez-Gómez et al., 2020). Governments worldwide now employ these technologies for administrative, service provision and surveillance purposes (Agostino et al., 2023; Henman, 2020; Straub et al., 2023). Also, data science technologies are increasingly being used to produce financial data, and for accountability, generating several challenges both in the production and the use of those data (Agostino et al., 2022; Tyma et al., 2022).

With respect to the *production* of accounting and financial information, data science can bring a challenge concerning non-traditional data sources, to complete 'official' data. The need to ensure the reliability of these sources demands adequate regulatory frameworks, to ensure transparency, auditability, and explainability (Agostino et al., 2023; Jiménez-Gómez et al., 2020). Accounting and financial reporting systems must allow information preparers to clearly understand how data is collected and how the results are generated (Cifuentes-Faura, 2023). This is essential for maintaining trust and enabling audits (Loi & Spielkamp, 2021). Subsequently, data science impacts organizational administrative practices (Bullock et al., 2020), including accounting, financial reporting, and auditing. Even modest changes to accounting policies can require substantial updates to information systems, which can be resource-intensive and have a significant financial impact (Adobor & Yawson, 2023). Furthermore, the automation of these systems increases vulnerability to cyber attacks, heightening litigation risks related to personal data protection (Rabbani, 2024) and introducing concerns about national sovereignty when relying on international software suppliers (Agostino et al., 2023; Cifuentes-Faura, 2023). The integration of data science tools into accounting and auditing practices offers great potential, but requires careful consideration of these challenges to ensure their effective and ethical use (Lehner et al., 2022; Loi & Spielkamp, 2021). Finally, there is a pressing need to educate and train accounting professionals to understand the capabilities, constraints, and ethical considerations of data science, including AI tools (Rabbani, 2024). Without this knowledge, professionals may struggle to effectively utilize data science and AI systems (Agostino et al., 2023).

© 2025 The Author(s). Published by Informa UK Limited, trading as Taylor & Francis Group
This is an Open Access article distributed under the terms of the Creative Commons Attribution-NonCommercial-NoDerivatives License (http://creativecommons.org/licenses/by-nc-nd/4.0/), which permits non-commercial re-use, distribution, and reproduction in any medium, provided the original work is properly cited, and is not altered, transformed, or built upon in any way. The terms on which this article has been published allow the posting of the Accepted Manuscript in a repository by the author(s) or with their consent.

Regarding the *use* of accounting and financial information for decision-making, while data science technologies enhance the usability of public sector financial information at both organizational (for example formulation of public policies and informed decision-making processes by providing advanced analytics) and individual (empowering citizens to access and quickly interpret public financial data, fostering participatory processes, and strengthening public accountability) levels, they also present significant challenges. The use of exogenous data in policy-making can inadvertently limit inclusivity and accessibility to public services (Agostino et al., 2023), for instance deciding to intervene or not based on biased data. Additionally, many data analytics tools and financial information systems operate as opaque 'black boxes', making their functioning and decision-making processes difficult for most users to understand (Lehner et al., 2022). This lack of transparency undermines trust in algorithmic-based decisions. Opacity can erode confidence, especially in public sector settings where accountability and openness are paramount (Loi & Spielkamp, 2021). Consequently, one major concern for users should be the potential for biased algorithms (Jiménez-Gómez et al., 2020; Lehner et al., 2022), accelerating system-level bureaucracy (Bullock et al., 2020), which can lead to unfair or skewed outcomes in decision-making (Cifuentes-Faura, 2023). The use of data science tools in public sector accounting extends beyond its technical merits to broader issues of governance and ethics (Straub et al., 2023). While these data science tools offer opportunities for efficiency, innovation, and fraud reduction (Rabbani, 2024), its integration into public sector (financial) decision-making must be approached with caution to avoid compromising accountability. AI technologies in financial reporting and auditing introduces significant efficiencies by automating repetitive tasks and improving predictive accuracy. However, this technological shift requires governments to establish frameworks that align with public sector values, ensuring ethical deployment and accountability (Jiménez-Gómez et al., 2020). Transparency is a recurring concern, particularly regarding how AI systems influence organizational decisions (Lehner et al., 2022), the origins and use of data, the mechanisms of monitoring and certification, and to secure 'clarity about the characteristics of the systems built around them' (Straub et al., 2023, p. 13). Ensuring clarity about the use of data science tools is crucial to maintaining public trust and safeguarding fundamental rights (Loi & Spielkamp, 2021; Cifuentes-Faura, 2023).

Governments and public institutions face the dual responsibility of fostering data science and AI innovation, while regulating its development and use, to ensure it serves the public interest. AI is acknowledged as having transformative potential, but it must be implemented with clear standards, societal alignment, and robust operational procedures (Straub et al., 2023). As regulators and users of data science technologies, governments must balance technological advancement with public accountability, ensuring adherence to democratic values and citizen rights (Jiménez-Gómez et al., 2020). In addition, politicians, legislators, and workers have expressed concerns about the potential misuse of data and the opaque workings of AI algorithms (Wirtz et al., 2019; Cifuentes-Faura, 2023). Public mistrust might increase if citizens remain unaware of how AI-driven decisions affecting them are made. To address these issues, it is crucial to develop robust governance mechanisms and auditing systems that ensure the quality, reliability, and transparency of decisions made by algorithms (Adobor & Yawson, 2023; Jiménez-Gómez et al., 2020; Loi & Spielkamp, 2021). Moreover, because AI lacks the cognitive and moral capacities necessary for ethical decision-making, in accounting and auditing it is important to employ a hybrid approach where humans provide ethical oversight and reasoning, while AI handles data analysis (Lehner et al., 2022). Equally important is enabling citizens and individual users to utilize generative and automated tools for finding, interpreting, and analysing financial reports. These tools should communicate information in accessible formats, such as popular reporting, without compromising the accuracy of such information (Agostino et al., 2023).

The challenges referred to above raise important questions about whether there has been enough academic research on these issues. There is an obvious need for further discussion, in order to support practitioners and policy-makers. The extent to which the literature and academic research on the public sector has addressed the association between data science and accounting, financial reporting and auditing, and the consequences on accountability issues, is unknown. This article addresses this gap by providing a structured literature review on these topics, explaining what has been explored so far, and identifying trends for future research, while analysing implications for production and use of financial information. The review focuses on financial accounting and reporting-related issues, hence the consideration of auditing. Management accounting is out of the scope of search and analysis.

In particular, we reflect on how the use of data science tools in public sector accounting, financial reporting and auditing, while impacting the production and use of financial information, affects accountability. Accountability is, in this context, understood as the obligation for public officials to report on the usage of public resources, and answerability of public sector entities and governments to the public, to meet stated performance objectives (Armstrong, 2005; Bovens, 2007).

Subsequently, the article answers the following research questions:

> *RQ1: What does the research done so far reveal about the use of data science in accounting, financial reporting, and auditing in the public sector?*
>
> *RQ2: What implications can be derived from this research to the production and use of financial information, and what are the areas requiring further exploration?*

This article proceeds by explaining our methodology, next we present the main findings of the qualitative content analysis of the papers, and then we conclude with final remarks and avenues for further research.

Methodology

We followed the PRISMA methodology searching documents in the Web of Science (WoS) and Scopus databases. The WoS database is considered a 'gold standard' for citation analyses (Harzing & Alakangas, 2016) and it is the database most used

by researchers (Amara & Landry, 2012). In particular, we focused on journal articles, both those published or in early access. Scopus was also used because it is currently the largest database of abstracts and scientific journal papers, books, and conference publications—hence allowing for a wider search. For the same reason, at the initial stage, restrictions were neither considered regarding the areas of knowledge, nor in the years of the publications.

We questioned both databases with a combination of terms related to accounting and financial reporting, in conjunction with the synonym terms of public sector, and of data science, as follows. The choice of 'data science' and alternative terms 'artificial intelligence' and 'machine learning' was deliberated, in order to capture the specificity of using these expressions in the context of financial information reporting and auditing in the public sector. This helped to improve the contribution of this research, as it narrows the analysis compared to other studies addressing digitalization in general in public administration and impact in public management overall (for example Agostino et al., 2022; Agba et al., 2023).

Scopus query

(TITLE-ABS-KEY ("accounting" OR "accountability" OR "financial" OR "audit")) AND (TITLE-ABS-KEY ("public sector") OR ("government") OR ("public management")) AND (TITLE-ABS-KEY ("data science" OR "artificial intelligence" OR "machine learning")) AND DOCTYPE (ar) AND (LIMIT-TO (SUBJAREA,"SOCI") OR LIMIT-TO (SUBJAREA,"BUSI"))

WoS Query

(TI = ("accounting" OR "accountability" OR "financial" OR "audit") OR AB = ("accounting" OR "accountability" OR "financial" OR "audit") OR AK = ("accounting" OR "accountability" OR "financial" OR "audit")) AND (TI = ("public sector" OR "government" OR "public management") OR AB = ("public sector" OR "government" OR "public management") OR AK = ("public sector" OR "government" OR "public management")) AND (TI = ("data science" OR "artificial intelligence" OR "machine learning") OR AB = ("data science" OR "artificial intelligence" OR "machine learning") OR AK = ("data science" OR "artificial intelligence" OR "machine learning"))

The search was done in June 2024, extracting 681 records from Scopus and 573 records from WoS. In this process, books, book sections, book reviews, and publications in languages other than English were disregarded. This process started the *Identification* stage in the PRISMA method, which was concluded after combining both databases, and cleaning for duplicated records (167) and other errors (two papers—one paper retracted; one record was corrupted), using Zotero software. Figure 1 summarizes the PRISMA method applied in this case.

The *Screening* stage started with a total of 1,085 publications. This stage was conducted in three steps. In the first step, the records were divided among the research team. Each researcher independently screened titles, abstracts, and keywords to exclude papers that were entirely out of scope, retaining only those that warranted further evaluation by the entire team in the next step. In the second step, all remaining records (111) were analysed by all researchers until an agreement was reached about which papers were relevant and should be retrieved. In this round, the assessment involved attributing 'yes/no' in four criteria about each paper's content: public sector, data science and artificial intelligence, and accounting, financial reporting, and auditing issues. From this assessment, only papers with 'three yeses' by all researchers were kept in the pool—a total of 28 papers. In a third step, a final refinement of the analysis led us to exclude five papers, due to eligibility criteria:

- Reason 1: The full paper is not written in English (despite the filters used in the identification step, and both title and abstract were written in English).
- Reason 2: Data science techniques were used as a research tool, but they were not part of the actual research subject.
- Reason 3: The paper was a debate paper, with no significant content to become part of the review.
- Reason 4: The paper was about accountability of artificial intelligence and algorithm-based tools, not about using these tools for financial reporting and accountability.

This concluded the screening phase, in which reading and final filtering allowed a final sample to be considered of 23 papers to review (*Included*). The papers in the sample are highlighted with an asterisk (*) in this article's reference list.

The analysis proceeded with an in-depth examination of the entire set of papers, which were distributed among the researchers. Each paper was assessed based on key aspects, including research topic, country/setting/context, theoretical framework or paradigm, research approach/method, main findings, and practical/theoretical implications. Finally, each paper was then more deeply scrutinized in terms of its relationship with data production, data use, accounting, financial reporting, and auditing.

The results of the analysis by each researcher were jointly discussed in several meetings and agreed upon between the researchers for consistency. These findings are presented in the following section.

Data science, accounting, financial reporting and auditing in the public sector

Overview of the research

In this section, the sample is briefly described in terms of distribution of papers over the years, by discipline/topic, and by research approach. One initial observation is that the research at the intersection of data science with accounting, financial reporting, auditing and public sector, is still scarce (only 23 full papers were found). It seems that this represents the inception stage of the phenomenon for academics in the public financial management field. In fact, Figure 2 shows that the interest on this field of research is clearly very recent, with 65% of the papers in the sample (15) published in the last three years.

In addition, 11 papers (48%) were published in journals ranked (by Scimago) in the area of 'Business, management and accounting', while also combining with 'Computer science' (nine papers) and 'Decision sciences' (six papers). Only six papers (26%) are in journals ranked in 'Social sciences' (which include 'Public administration'). While this reveals possible multidisciplinary approaches followed by

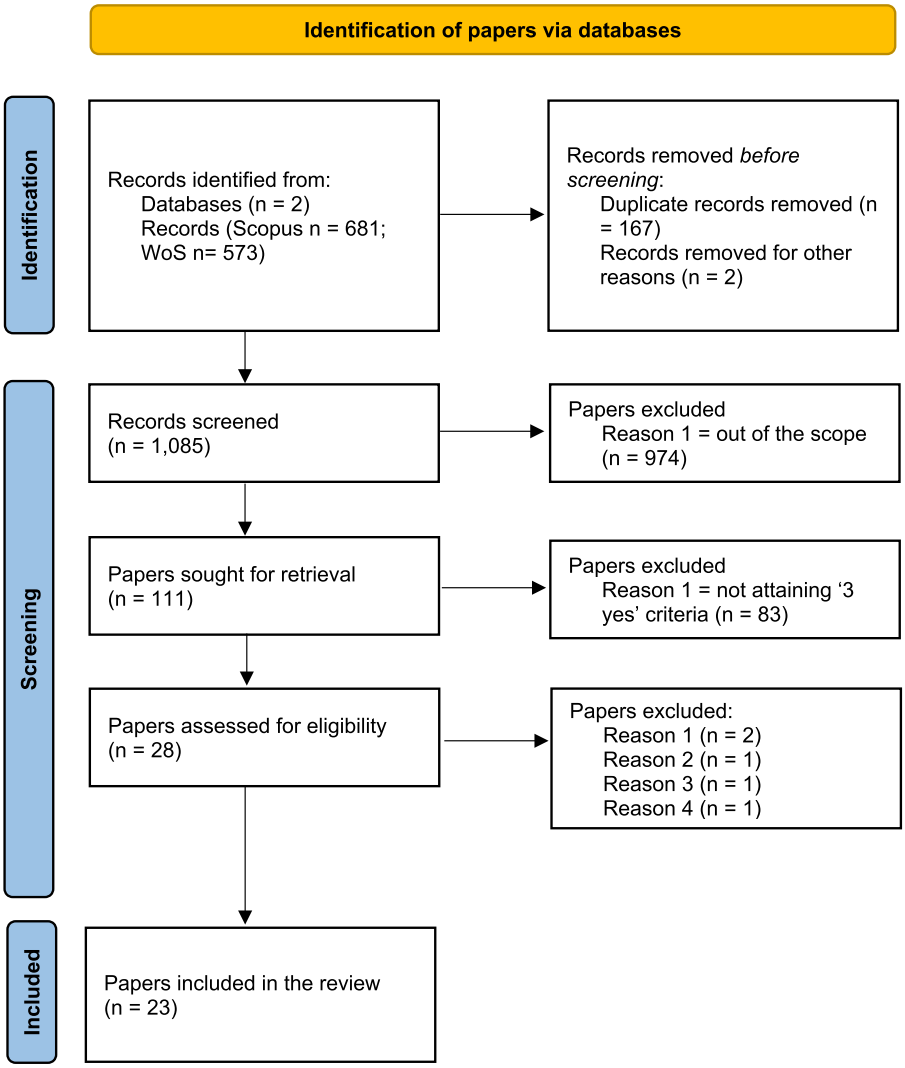

Figure 1. Flow diagram application of the PRISMA 2020 method used for the search of papers.

the authors in the papers, further research and publications in the field of 'Social sciences', and 'Public administration', in particular, seems to be missing, for example addressing legal and ethical issues when using data science tools for accounting, financial reporting and auditing.

Also, it is interesting to note that most of the research, according to the papers in our sample, evidences a clear focus on auditing—about 43% of the sample (Figure 3). In fact, the oldest paper in the sample, Wu (1997), was about applying data science (neural network models) to an audit

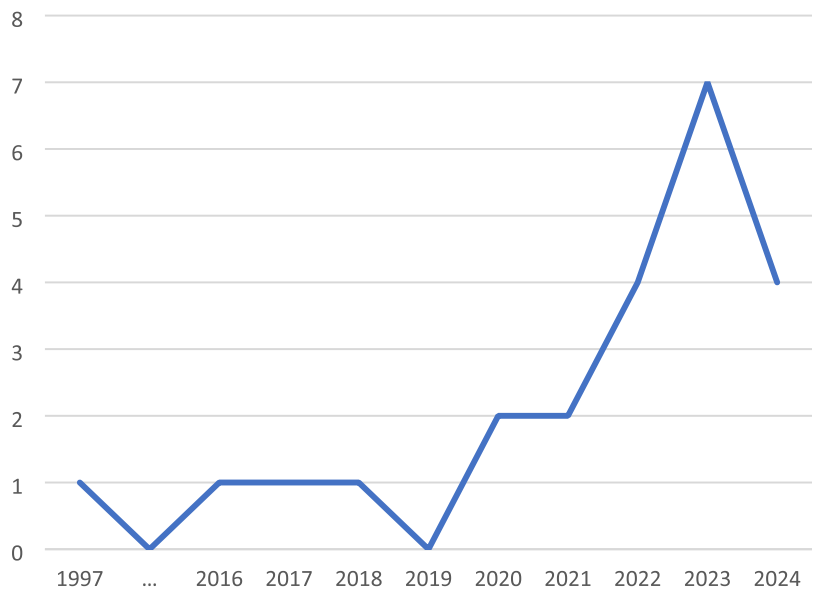

Figure 2. Evolution of the publications in the sample.

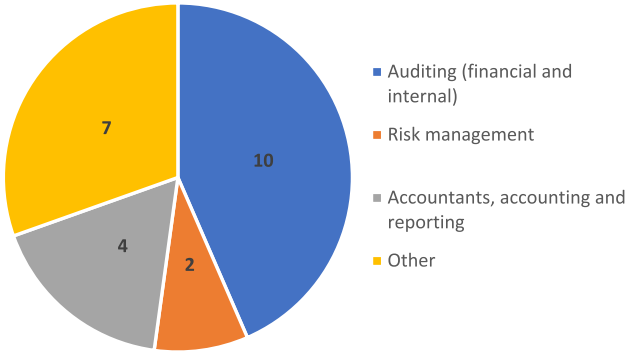

Figure 3. Research areas.

decision problem faced by tax auditors in internal revenue services in Taiwan, suggesting future implications for intelligent auditing machines. Moreover, some papers have addressed the use of data science tools in the financial auditing process and outcomes (for example Alles & Gray, 2020; Mabelane et al., 2023), while others have studied the potential of those tools to identify internal auditing topics (for example Aljanaby et al., 2024; Korol et al., 2022).

There is a dearth of studies about data science tools in financial accounting, reporting and accountability. Some papers address 'other' topics—all were related to performance management. Among these, only one (Bracci, 2023) specifically addressed accountability issues, identifying the main challenges that an AI algorithm might pose to public service accountability. Two papers were classified as addressing financial risk management, because they focused the use of data science tools to predict bankruptcies in municipalities (Antulov-Fantulin et al., 2021), and to estimate sovereign risk in the Euro area (Belly et al., 2023).

Regarding research approaches, as illustrated in Figure 4, half of the papers in our sample addressed conceptual issues, where data science tools are generally discussed concerning advantages and disadvantages of their application to accounting and financial reporting, and especially auditing, but do not constitute empirical studies. Very few papers involved empirical research, dividing between case study, quantitative approaches (for example survey to professionals—Al Wael et al., 2024), and other, mostly using machine learning techniques and predictive models. It seems that the analysed literature is more concerned with conceptualizing the potential implications of data science rather than analysing its applications and actual consequences for public sector accounting, financial reporting and auditing.

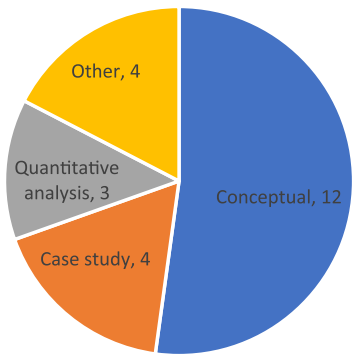

Figure 4. Research approaches.

Even if based on literature reviews, and sometimes framed by the New Public Management and accountability paradigms, most papers did not rely on any theory, but followed functionalistic and normative approaches. Two exceptional cases used the Benford Law Model (Arslan et al., 2024; Wiryadinata et al., 2023).

As to the object of study, while some papers did not address any country in particular, but focused on specific public sector realities (for example Aljanaby et al. [2024], supreme audit institutions; 2023], public services; and 2022], higher education), five papers are about the USA, and three about the European context (Eurozone, Italy and Ukraine). Five other papers addressed single additional countries: Brazil, South Africa, Taiwan, Canada and Kuwait. Therefore, more comparative international research is missing, particularly in the context of the EU, also considering the recent approval of Regulation (EU) 2024/1689 of the European Parliament and of the Council (13 June 2024). This Regulation lays down harmonized rules on AI, offering general provisions for improving:

> *… the functioning of the internal market and promote the uptake of human-centric and trustworthy artificial intelligence (AI), while ensuring a high level of protection of health, safety, fundamental rights enshrined in the Charter, including democracy, the rule of law and environmental protection, against the harmful effects of AI systems in the Union and supporting innovation* (article 1, No. 1).

In preface §97 of Regulation (EU) 2024/1689 it is acknowledged that, when AI systems are to be used in the context of public sector, AI deployers should involve stakeholders affected by these tools, namely for impact assessment and risk evaluation. This requirement should be taken into consideration to develop future research on the development and use of data science tools supporting accounting, financial reporting, and auditing in governments at all levels, and in the public sector overall.

Research trends and implications

Next we summarize the main findings related to the application of data science tools in financial data production and use, in the public sector. Additionally, some reflections are offered on implications for accounting, financial reporting, auditing, and accountability.

Data science and its implications on the production of financial data

Data science technologies have the potential to improve the quality and efficiency of the reporting entities in producing financial data. They can have a transformative impact both on the producers of financial data (for example accountants), as well as on the financial reports produced. First and foremost, technologies can improve:

- *Efficiency*: by automating routine tasks, like data entry, reconciliation, regular bookkeeping.
- The *effectiveness* of the data: by reducing the number of errors.
- The *quality* of the data: machine learning algorithms excel in automating data entry tasks, as they can

swiftly and accurately input data from various sources, minimizing the need for manual intervention. The result is not only a reduction in the time spent on data entry, but also a significant decrease in the likelihood of errors that may occur during manual input (Bignami, 2022).

The possibility of continuously producing accounting data is also an advantage for real time reporting and auditing (Bora et al., 2021).

As a consequence, accountants are able to devote more time to value-added strategic activities and analyses to support government decision-making. Examples include producing financial analyses to categorize factors influencing financial performance, identifying patterns to detect areas of improvement, such as tax collection efficiency. Machine learning algorithms can empower accountants, allowing them to analyse diverse datasets, made up of structured and unstructured data, for example from social media, and economic indicators. This permits a multidimensional analysis beyond the traditional accounting data, making it possible to have a much better understanding of an entity's financial performance (Brady et al., 2017).

Additionally, data science technologies can expand their use towards forecasting and strategic planning. Machine learning algorithms can provide scenario analyses and predictive modelling that can be effectively used to compel the strategic (financial) planning of governments, as well as improving the internal audit system (Korol et al., 2022).

Another promising data analysis technology in accounting is Natural Language Processing AI (NLP-AI). NLP-AI facilitates communication between individuals and computers by representing naturally occurring texts and achieving human-like language processing abilities (Guariso et al., 2023). Applications of NLP-AI in data production can span from analysing data to predict and/or detect fraud, by generating red flags, to demonstrating an association between text-based content and financial phenomena (Andrade et al., 2022). NLP-AI can also help in improving the readability of accounts and disclosure (Fisher et al., 2016).

A relevant area to be investigated is related to the production of data to support fraud and corruption detection and prevention. Often corruption is hidden behind a lack of transparency and accountability in operations and processes. Data analysis technologies have the potential to create new visibilities supporting the internal control systems, as well as internal and external auditing practices (Korol et al., 2022).

These potentialities in the use of data science technologies have implications for accountants and accounting education in particular (Cohen et al., 2023). Accountants need to acquire familiarity with these technologies to extract the potential value out of them. They have to become data scientist experts, as their accounting knowledge will be still the base for financial data producers, to give appropriate inputs to the data science technologies and to interpret the output, as well as assess its relevance. Accountants need to be able to engage with the algorithm producers and to grant transparency and accountability of the data production process (Bracci, 2023). The latter is important as the data-driven technologies in the public sector are normally acquired by third-party AI producers. As a consequence, this may increase the risk of black-booking the data production process reducing the level of security, transparency, and accountability. The procurement contracts should include clauses addressing data security, outlining responsibilities, and risk management processes in the event of incidents. These issues have been particularly highlighted in the Regulation (EU) 2024/1689 of the European Parliament and of the Council (13 June 2024), which establishes harmonized rules on AI within the EU.

The adoption of data analysis technologies in financial data production requires the presence of technical proficiency and understanding their functionalities. A multidisciplinary group has been recommended to bring accountants together with data scientists, AI specialists and professionals (Beerkens, 2022; Al Wael et al., 2024). This can be a problem for smaller entities that lack the financial and human resources to acquire these skills and resources. In these cases, central and regional governments will need to support smaller entities by sharing resources as well as best practices.

The above considerations are also valid in the case of producing consolidated accounts—both in relation to group accounts or the national consolidated accounts. The latter has also important macro-economic effects and can contribute to the production of more efficient, timely and reliable information.

Sustainability data and reporting are nowadays increasingly common and reporting entities can leverage data science technologies to produce richer data to respond to both sustainability reporting standards requirements and the different information needs of stakeholders (Guariso et al., 2023).

Data science and its implications on the use of financial data

The increasing integration of algorithmic-based technologies in accounting, financial reporting, and auditing processes has catalysed a profound transformation in how financial information is utilized for decision-making. Advances in AI, machine learning, and data analytics have redefined traditional financial processes. These developments have opened up new frontiers for the users of financial information for decision-making in the public sector—increasing precision, efficiency, and ensuring greater public accountability, while also introducing ethical, operational and governance challenges.

Users of financial information in the public sector include policy-makers, auditors, government officials, and the general public. The papers we analysed show that data science and AI influence how these users interact with financial data, enhancing their ability to make informed decisions. However, challenges arise when AI-generated insights lack interpretability, making it difficult for non-technical users to assess financial risks accurately (for example Koreff et al., 2023; Mabelane et al., 2023). Bracci (2023) emphasizes the importance of intelligent accountability in AI-driven financial governance. As AI systems become integral in public financial management, it is crucial to establish mechanisms that ensure that financial information remains accessible, understandable, and actionable for all users. The role of blockchain technology in ensuring data integrity in government financial transactions is critical (Azzam et al.,

2023). Blockchain-based systems enhance transparency, providing users with tamper-proof financial records. This development is particularly significant for auditors and policy-makers who should rely on accurate financial data for decision-making.

AI-driven decision-making in the public sector is characterized by machine learning algorithms that analyse vast datasets of structured and unstructured data in real time to predict financial trends and assess risks. Robo-advisors and algorithmic trading platforms now leverage predictive analytics to generate rapid insights, facilitating decisions previously dependent on human judgment. While AI-based decision-making enhances efficiency in the public sector, it also raises ethical concerns related to accountability and transparency (Lehner et al., 2022). AI enables governments to optimize tax collection, allocate resources efficiently, and minimize budgetary waste. However, algorithmic opacity can make it difficult for decision-makers to understand how financial outcomes are generated. In fact, the complexity of these systems further complicates accountability, as many operate with minimal transparency, reinforcing systemic biases and potentially accelerating bureaucracy (Bullock et al., 2020).

Antulov-Fantulin et al. (2021) highlight the use of AI in predicting the potential bankruptcy of municipalities by analysing financial and socio-economic indicators. This predictive capability allows governments to proactively address financial distress, ensuring the sustainability of public finances. Governments worldwide have embraced AI and data science to manage financial information, aiming to optimize applications in financial management, ranging from predictive analytics for budget allocation to automated fraud detection systems. The automation of auditing processes through AI has significantly improved fraud detection capabilities. AI-powered tools analyse financial records for anomalies, flagging suspicious transactions with high accuracy (Aldemİr & Uysal, 2024). Machine learning models, such as those based on Benford's Law, have been particularly effective in detecting irregular financial activities (Wiryadinata et al., 2023). By clustering financial data, and applying AI-based anomaly detection, auditors can identify fraudulent activities more efficiently.

Despite the potential of AI to enhance fraud detection, it comes with considerable challenges. The increasing reliance on big data in government decision-making requires greater transparency to ensure accountability (Redden, 2018). The concept of accountability of algorithms emphasizes the need for oversight mechanisms that ensure AI-driven financial decision-making aligns with public sector governance principles (Wirtz et al., 2019; Engstrom & Ho, 2020). The ethical dimensions of AI in public finance also warrant attention, particularly regarding bias mitigation and fairness in resource allocation. Likewise, as AI models are trained on historical financial data, that may contain inherent biases. Additionally, AI's reliance on large datasets raises privacy and security issues, particularly when handling sensitive financial information. Governance frameworks must be developed to ensure that AI applications adhere to ethical and legal standards (Engstrom & Ho, 2020).

Ethical concerns also arise when AI-driven audits lead to false positives, potentially misclassifying legitimate transactions as fraudulent. This underscores the importance of human oversight in AI-assisted audits. Nevertheless, reliance on AI-driven models necessitates robust oversight mechanisms to mitigate biases and erroneous predictions. An audit is valued based on the trust that consumers of audited financial statements have on the audit process. That trust historically was placed with the auditor—human-based assurance; but, now, what contributes to this trust in the audit work process is more the technology, whether that of the auditor or of the client (Alles & Gray, 2020).

The public sector, in particular, illustrates the dual-edged nature of algorithmic-based technologies. On the one hand, data science tools enhance the usability of public sector financial information, improving policy formulation and empowering citizens to interpret public data. These tools facilitate participatory governance by making financial information more accessible, fostering transparency, and strengthening public accountability. However, the use of exogenous data can inadvertently limit inclusivity and accessibility to public services, raising ethical concerns about fairness and equity in policy outcomes (Agostino et al., 2022; 2023).

Implications of data science on accounting, financial reporting, auditing and accountability

The integration of data science into the realm of financial information in the public sector has significant implications for accounting, financial reporting, auditing, and accountability. The reviewed literature highlights both the transformative potential and the critical challenges that accompany the adoption of algorithmic tools, machine learning techniques, and AI-based auditing systems. While these technologies enhance efficiency, reduce errors, and improve predictive accuracy, they also introduce significant concerns regarding transparency, accountability, and regulatory oversight (Aljanaby et al., 2024; Bracci, 2023).

In *accounting*, data science facilitates real-time processing, continuous auditing, and automated reconciliation, which fundamentally alters the role of accountants. Several studies indicate that machine learning algorithms can detect anomalies and fraud patterns, significantly improving financial control mechanisms (Antulov-Fantulin et al., 2021; Wiryadinata et al., 2023). However, these advances are not without risks. The reliance on AI-driven systems raises concerns about the explainability of financial decisions, a crucial issue for public sector institutions, where transparency is a legal and ethical requirement (Lehner et al., 2022). Without clear interpretability frameworks, AI-based accounting systems may reduce trust in financial reporting processes, leading to resistance from both internal and external stakeholders (Jiménez-Gómez et al., 2020).

From a *financial reporting* perspective, data science offers opportunities to enhance financial disclosures by integrating structured and unstructured data sources, including trending views posted on social media and economic indicators (Belly et al., 2023). Duan et al. (2023) showed how it is possible to use data mining and machine learning techniques to enrich government accounting information with unstructured data from social media platforms. This broader dataset allows for a more comprehensive assessment of financial performance and risk exposure. By integrating data science tools, namely AI,

for fraud detection, risk analysis, and compliance monitoring, these fields can improve the reliability of financial practices and ethical oversight in the public sector, aligning with the broader goals of enhancing transparency and accountability (Adobor & Yawson, 2023). However, studies suggest that the integration of non-traditional data sources may challenge the standardization of financial reporting, as regulatory bodies struggle to establish guidelines that ensure data comparability and reliability (Korol et al., 2022). Additionally, NLP-based reporting tools, while improving readability and accessibility, risk oversimplifying complex financial information, potentially distorting key messages in financial statements (Azzam et al., 2023).

In the *auditing* domain, data science is significantly altering traditional audit methodologies, allowing auditors to move from sample-based to full-population testing. Predictive analytics and anomaly detection algorithms are increasingly employed to identify financial irregularities (Arslan et al., 2024). However, the reviewed literature raises concerns about the ethical implications of algorithmic auditing. Several studies highlight the potential for biased AI models, particularly when trained on historical financial data that may reflect systemic biases (Cifuentes-Faura, 2023). This challenge underscores the need for hybrid audit approaches that combine AI-driven efficiency with human expertise to ensure professional judgment remains central to audit conclusions (Lehner et al., 2022).

Accounting, financial reporting and auditing practice, powered by data science tools, can have significant implications for *accountability* too. Accountability requires data production and data analysis to make public sector managers and politicians accountable for their actions and the use of public resources. This has also ethical implications as the complex data science tools may create black-boxes with no understanding of how certain data were produced (Bracci, 2023). It is important to remember that accountability is socially constructed and, as a result, we cannot simply delegate its functioning to data science tools, as it always requires human intervention. Data science tools can certainly improve transparency in public funding uses and performance, but these tools do little in terms of liability, controllability, responsibility and responsiveness of public officials and politicians alike (Koppell, 2005).

Table 1. Future research avenues. (Source: authors' elaboration.)

Perspective	Future research
Theoretical approach	Go beyond functionalistic and normative approaches adopting more interpretative and interdisciplinary approaches. Develop case studies and longitudinal analyses of real-life applications.
Machine–human relationship	Consider the synergy between human expertise and machine intelligence to create a more resilient and equitable financial management ecosystems in public sector entities. Understand how accountants and auditors interact with data-driven systems is essential to safeguarding professional judgment and regulatory oversight. Explore the implications of AI adoption on the skills and competencies required for public sector accountants and auditors.
Data science processes implementation and control	Assess the organizational impact of data science tools, particularly in terms of decision-making, reporting processes, and stakeholder trust. Examine governance mechanisms that ensure accountability and mitigate risks associated with AI-driven financial decision-making. Examine the procurement policies, data security challenges, and the broader impact on public sector accountability, as acknowledged by the EU's recently-approved AI Regulation. Examine how AI-driven financial systems align with public sector values, reinforcing accountability rather than undermining it. Study AI governance frameworks, the regulatory oversight mechanisms.

Conclusion

Data science and algorithmic-based technologies are redefining the landscape of accounting, financial reporting, auditing, and accountability in the public sector. While these technologies offer unparalleled opportunities for efficiency and transparency, successful implementation depends on overcoming existing challenges and fostering a culture of continuous innovation and ethical governance (Rabbani, 2024).

This systematic literature review underscores the transformative potential of data science in public sector accounting, financial reporting, and auditing, offering three main points of reflection for further research (see Table 1).

The first contribution relates to the *theoretical perspectives* adopted to investigate the data science phenomenon. While existing studies highlight the benefits of automation, anomaly detection, and predictive analytics, they also reveal critical challenges related to transparency, regulatory compliance, and ethical considerations. However, these aspects are not emerging from current studies as the current researches adopt a functionalist and normative approach rather than engaging with broader conceptual debates. Future research should adopt interdisciplinary perspectives by integrating accounting, financial reporting, data science, and public administration to develop robust theoretical models for AI-driven public sector financial management. More specifically, theoretical frameworks, including those from different fields, can be useful in shedding lights on the themes, from accounting theories, public management/administration theories, information system theories, as well as drawing from sociological and organizational theories with different approaches.

The second contribution relates to the need to analyse in an integrated manner the *machine–human relations* in data science. Our literature review has underlined the potentialities that data science offers for efficiency, innovation, fraud detection, and auditing. However, there are associated risks of developing several financial documents driven by data science tools rather than by human interventions. Future research should consider the synergy between human expertise and machine intelligence to create more resilient and equitable financial management ecosystems in public sector entities. This requires focusing on explainable AI models for financial decision-making, ensuring regulatory compliance in AI-driven financial reporting, and fostering interdisciplinary collaboration between accountants, data scientists, and policy-makers to navigate the evolving landscape of public sector accountability. Collaboration of this kind would

contribute to the effective deployment of accounting, financial reporting and auditing data science tools, and would take into account political options and ethical issues. The machine–human relationship also requires deeper research into the role of professional expertise in hybrid AI–human auditing environments. As automation reshapes financial control practices, understanding how accountants and auditors interact with data-driven systems is essential to safeguarding professional judgment and regulatory oversight. Research should also explore the implications of AI adoption on the skills and competencies required for public sector accountants and auditors, emphasizing the need for new educational frameworks that integrate data literacy with traditional accounting and auditing expertise.

The third contribution relates to *how data science processes are implemented and controlled*—an area that has had limited investigation with empirical research. Further research should explore case studies and longitudinal analyses to assess the organizational impact of data science tools, particularly in terms of decision-making, reporting processes, and stakeholder trust. Additionally, given the concerns surrounding algorithmic bias and data sovereignty, future investigations should examine governance mechanisms that ensure accountability and mitigate risks associated with AI-driven financial decision-making. Connected to this, issues related to data sovereignty and cyber security should be added to the research agenda. The public sector's dependency on proprietary algorithms developed by external vendors may lead to opaque decision-making processes, where neither data producers, data users nor regulators have full access to the underlying logic of financial analyses. This includes examining procurement policies, data security challenges, and the broader impact on public sector accountability, as acknowledged by the EU's recently-approved AI Regulation. Beyond technical challenges, the adoption of data science in accounting, financial reporting, and auditing requires studying the governance structures. Governments must ensure that AI-driven financial systems align with public sector values—reinforcing accountability rather than undermining it. This includes establishing clear AI governance frameworks, standardizing regulatory oversight mechanisms and ensuring that AI-driven financial tools are subject to the same scrutiny as traditional accounting and auditing practices.

By addressing these gaps, future research can contribute to a more comprehensive understanding of the intersection between data science and public financial management, ensuring that technological advancements align with democratic values and governance principles.

This article contributes to this goal by taking stock of the research done so far about the use of data science tools for accounting, financial reporting and auditing. Implications for accountability were derived and analysed. Important gaps have been identified to guide future research.

This article contributes to practice by alerting policy-makers to the need to regulate the use of data science tools in the context of public sector accounting, financial reporting and auditing, taking into account the risks and challengesinvolved in decision-making and accountability processes.

Nevertheless, some limitations must also be acknowledged, namely related to the search process and the individual perceptions reflected in the analysis of the selected papers, even though predefined criteria were agreed and refined in several meetings involving all members of the research team. In fact, the use of very specific search terms ('data science', 'artificial intelligence' and 'machine learning'), which are quite new in the public financial management area, may have been responsible for the relatively small sample of papers and years analysed.

Disclosure statement

No potential conflict of interest was reported by the author(s).

ORCID

Susana Jorge http://orcid.org/0000-0003-4850-2387

References

Adobor, H., & Yawson, R. (2023). The promise of artificial intelligence in combating public corruption in the emerging economies: a conceptual Framework. *Science and Public Policy*, *50*(3), 355–370.

Agba, M. S., Agba, G. E. M., & Obeten, A. W. (2023). Artificial intelligence and public management and governance in developed and developing market economies. *Journal of Public Administration, Policy and Governance Research*, *1*(2), 1–14.

Agostino, D., Bracci, E., Cruz, I., Jorge, S., Cardoso, R. L., & Lourenço, R. (2023). Debate: Data science challenges to financial information in the public sector. *Public Money & Management*, *43*(8), 773–776. https://doi.org/10.1080/09540962.2023.2221526

Agostino, D., Saliterer, I., & Steccolini, I. (2022). Digitalization, accounting and accountability: A literature review and reflections on future research in public services. *Financial Accountability & Management*, *38*(2), 152–176.

Aldemİr, C., & Uysal, T. U. (2024). AI competencies for internal auditors in the public sector. *EDPACS*, *69*(1), 3–21. (*).

Aljanaby, A., Abdel-Hafez, A., Xu, Y., & Rose, T. (2024). Machine learning approach to identify performance audit topics for different government sectors. *International Journal of Accounting, Auditing and Performance Evaluation*, *20*(3-4), 437–451. (*).

Alles, M., & Gray, G. (2020). Will the medium become the message? A framework for understanding the coming automation of the audit process. *Journal of information systems*, *34*(2), 109–130. (*).

Al Wael, H., Abdallah, W., Ghura, H., & Buallay, A. (2024). Factors influencing artificial intelligence adoption in the accounting profession: the case of public sector in Kuwait. *Competitiveness Review*, *34*(1), 3–27. (*).

Amara, N., & Landry, R. (2012). Counting citations in the field of business and management: why use Google Scholar rather than the Web of Science. *Scientometrics*, *93*(3), 553–581.

Andrade, A. D., Marques, L. G., Resende, O., de Oliveira, G. A., Souza, L. R. D., & Pereira, A. A. (2022). Prediction and visualization of SICONV project profiles using machine learning. *Systems*, *10*, 252. (*).

Antulov-Fantulin, N., Lagravinese, R., & Resce, G. (2021). Predicting bankruptcy of local government: a machine learning approach. *Journal of Economic Behavior and Organization*, *183*, 681–699. (*).

Armstrong, E. (2005). Integrity, transparency and accountability in public administration: Recent trends, regional and international developments and emerging issues. *Economic & Social Affairs* (pp. 1–14). United Nations.

Arslan, Ü, Tunca Çalıyurt, K., & Bozkuş Kahyaoğlu, S. (2024). Financial statement anomaly detection based on Benford Law and Beneish Model: case of a public sector hospital. *Edpacs*, *69*(1), 69–87. (*).

Azzam, F., Jaber, M., Saies, A., Kirresh, T., Awadallah, R., Karakra, A., Barghouthi, H., & Amarneh, S. (2023). The use of blockchain technology and OCR in e-government for document management: inbound invoice management as an example. *Applied Science*, *13*(14), 8463. (*).

Beerkens, M. (2022). An evolution of performance data in higher education governance: a path towards a 'big data' era? *Quality in Higher Education*, *28*(1), 29–49. (*).

Belly, G., Boeckelmann, L., Caicedo Graciano, C. M., Di Iorio, A., Istrefi, K., Siakoulis, V., & Stalla-Bourdillon, A. (2023). Forecasting sovereign risk in the Euro area via machine learning. *Journal of Forecasting*, *42*(3), 657–684. (*).

Bignami, F. (2022). Artificial intelligence accountability of public administration, *The American Journal of Comparative Law*, 70, Issue Supplement_1, October, i312-i346. https://doi.org/10.1093/ajcl/avac012

Bora, I., Duan, H. K., Vasarhelyi, M. A., & Zhang, C. (2021). The transformation of government accountability and reporting. *Journal of Emerging Technologies in Accounting*, *18*(2), 1–21. (*).

Bovens, M. (2007). Analysing and assessing accountability: a conceptual framework. *European Law Journal*, *13*(4), 447–468.

Bracci, E. (2023). The loopholes of algorithmic public services: an 'intelligent' accountability research agenda. *Accounting, Auditing & Accountability Journal*, *36*(2), 739–763. (*).

Brady, E. S., Leider, J. P., Resnick, B. A., Alfonso, Y. A., & Bishai, D. (2017). Machine-learning algorithms to code. Public health spending accounts. *Public Health Reports*, *132*(3), 350–356. (*).

Bullock, J., Young, M. M., & Wang, Y.-F. (2020). Artificial intelligence, bureaucratic form, and discretion in public service. *Information Polity*, *25*(4), 491–506.

Cifuentes-Faura, J. (2023). Debate: Will AI affect the transparency and accountability of public sector accounting?. *Public Money & Management*, *44*(*2*), 154–155. http://doi.org/10.1080/09540962.2023.2267305

Cohen, S., Manes Rossi, F., & Brusca, I. (2023). Debate: Public sector accounting education and artificial intelligence. *Public Money & Management*, *43*(7), 725–726. https://doi.org/10.1080/09540962.2023.2209290

Duan, H. K., Vasarhelyi, M. A., Codesso, M., & Alzamil, Z. (2023). Enhancing the government accounting information systems using social media information: An application of text mining and machine learning. *International Journal of Accounting Information Systems*, *48*, 100600. (*).

Engstrom, D. F., & Ho, D. E. (2020). Algorithmic accountability in the administrative state. *Yale Journal on Regulation*, *37*(3), 800–854. (*).

Fisher, I. E., Garnsey, M. R., & Hughes, M. E. (2016). Natural language processing in accounting, auditing and finance: a synthesis of the literature with a roadmap for future research. *Intelligent Systems in Accounting, Finance and Management*, *23*, 157–214. (*).

Guariso, D., Guerrero, O. A., & Castañeda, G. (2023). Automatic SDG budget tagging: Building public financial management capacity through natural language processing. *Data & Policy*, *5*(31), 1–15. (*).

Harzing, A.-W., & Alakangas, S. (2016). Google Scholar, Scopus and the Web of Science: a longitudinal and cross-disciplinary comparison. *Scientometrics*, *106*(2), 787–804.

Hayashi, C. (1998). What is data science? Fundamental concepts and a heuristic example. In C. Hayashi, K. Yajima, H. H. Bock, N. Ohsumi, Y. Tanaka, & Y. Baba (Eds.), *data science, classification, and related methods. studies in classification, data analysis, and knowledge organization*. Springer. https://doi.org/10.1007/978-4-431-65950-1_3

Henman, P. (2020). Improving public services using artificial intelligence: possibilities, pitfalls, governance. *Asia Pacific Journal of Public Administration*, *42*(4), 209–221.

Jiménez-Gómez, C. E., Cano-Carrillo, J., & Falcone Lanas, F. (2020). Artificial intelligence in government. *Computer*, *53*(10), 23–27.

Koppell, J. G. S. (2005). Pathologies of accountability: ICANN and the challenge of 'Multiple Accountabilities Disorder'. *Public Administration Review*, *65*(1), 94–108.

Koreff, J., Baudot, L., & Sutton, S. G. (2023). Exploring the impact of technology dominance on audit professionalism through data analytic-driven healthcare audits. *Journal of Information Systems*, *37*(3), 59–80. (*).

Korol, V., Dmytryk, O., Karpenko, O., Riadinska, V., Basiuk, O., Kobylnik, D., Moroz, V., Safronova, O., Alisov, E., & Mishchenko, T. (2022). Elaboration of recommendations on the development of the state internal audit system when applying the digital technologies. *Transfer of Technologies: Industry, Energy, Nanotechnology*, *13*(115), 1–30. (*).

Lehner, O. M., Ittonen, K., Silvola, H., Ström, E., & Wührleitner, A. (2022). Artificial intelligence based decision-making in accounting and auditing: ethical challenges and normative thinking. *Accounting, Auditing & Accountability Journal*, *35*(9), 109–135.

Loi, M., & Spielkamp, M. (2021). Towards accountability in the use of artificial intelligence for public administrations. *In Proceedings of the 2021 AAAI/ACM Conference on AI, Ethics, and Society*, 757–766.

Mabelane, K., Mongwe, W. T., Mbuvha, R., & Marwala, T. (2023). An analysis of local government financial statement audit outcomes in a developing economy using machine learning. *Sustainability*, *15*(1), 12. (*).

Nadikattu, R. (2020). Research on data science, data analytics and big data. *International Journal of Engineering, Science and Mathematics*, *9*(5), 99–105.

Provost, F., & Fawcett, T. (2013). Data science and its relationship to big data and data-driven decision-making. *Big Data*, *1*(1), 51–59.

Rabbani, M. R. (2024). Impact of digital advancements on accounting, auditing and reporting literature: insights, practice implications and future research directions. *Journal of Accounting & Organizational Change*, https://doi.org/10.1108/JAOC-01-2024-0028

Redden, J. (2018). Democratic governance in an age of datafication: Lessons from mapping government discourses and practices. *Big Data & Society*, *5*(2), 1–13. (*).

Straub, V. J., Morgan, D., Bright, J., & Margetts, H. (2023). Artificial intelligence in government: Concepts, standards, and a unified framework. *Government Information Quarterly*, *40*(4), 101881.

Tyma, B., Dhillon, R., Sivabalan, P., & Wieder, B. (2022). Understanding accountability in blockchain systems. *Accounting, Auditing & Accountability Journal*, *35*(7), 1625–1655.

Wirtz, B. W., Weyerer, J. C., & Geyer, C. (2019). Artificial intelligence and the public sector—applications and challenges. *International Journal of Public Administration*, *42*(7), 596–615.

Wiryadinata, D., Sugiharto, A., & Tarno, T. (2023). The use of machine learning to detect financial transaction fraud: Multiple Benford Law model for auditors. *Journal of Information Systems Engineering and Business Intelligence*, *9*(2), 239–252. (*).

Wu, R. (1997). Neural network models: Foundations and applications to an audit decision problem. *Annals of Operations Research*, *75*(0), 291–301. (*).

Deborah Agostino is Associate Professor of Accounting, Finance and Control at Politecnico di Milano, Italy. Her research focuses on digital transformation, data governance, and accountability in the public and cultural sectors.

Rui Lourenço was Assistant Professor at the Faculty of Economics, University of Coimbra, Portugal. His research focused on e-government, transparency, public accountability, and the use of digital technologies in public administration.

Susana Jorge is Associate Professor of Accounting at the Faculty of Economics, University of Coimbra, Portugal. She specializes in public sector accounting, financial reporting and IPSAS, transparency and public financial management overall.

Enrico Bracci is Professor of Accounting at the University of Ferrara, Italy. His research explores performance measurement, accountability, and innovation in public sector organizations and accounting and accountability for public value.

Isabel Cruz is Assistant Professor at the Faculty of Economics, University of Coimbra, Portugal. Her research interests include public sector management accounting, financial sustainability, and management control in health care.