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Auditing, the State and Democracy in a "New" Machine Age of Digitalization: The UK Supreme Audit Institution

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ABSTRACT

Many promises have been made about digitalization in the public sector, from its potential to revolutionize government to its emancipating properties as a new conduit for democracy. In this paper, the case of a leading Supreme Audit Institution (SAI), the UK National Audit Office, is examined. SAIs are essential to the ways in which government is managed and held to account. The paper examines the paradox that despite the promises made about digitalization, the digitalization of audit has progressed but has not been as revolutionary as its evangelists would expect. The paper breaks down the reasons for this by examining the regulatory space in which SAIs sit: Looking at their mandate, capacity, and reporting, and it shows that in all these, there are reasons why it is harder to digitalize than it looks from the outside. This has lessons for the broader public sector and beyond regarding change and technology.

1 | Introduction

The digital revolution has created upheaval in most industries, including public services (Suskind and Suskind 2015). Indeed, governments in the 21st Century are learning to cope with the new era of 'digipolis'—digitalstates—to manage public services, as in the 20th Century they had to come to terms with the 'metropolis'—large cities with citizens moving from rural to urban areas. In this context, digitalization is seen as all pervasive, affecting all state services and interactions with citizens, creating open challenges, and wicked problems for democracy, especially those of governance and accountability.

Evangelists for the digitalizing of public services have suggested that in public administration, as elsewhere, there is vast capability for digitalization to transform the powers, efficiency, and democratic accountability of the state (Dunleavy et al. 2006; Dunleavy and Margetts 2013, 2023; Rogge et al. 2017). Some of these impacts have been clearly realized: For example, during the pandemic, accountability was transformed by the fact that citizens could hold their government to account using digitally published statistics and debate the meaning of government action on the internet (Ferry et al. 2024). However, there are skeptics about the transformative possibilities of public sector digitalization, arguing either that public services are hard to digitalize because so many of them are personal (Baumol 2012) or presenting case studies for evolutionary or no change (Greve 2015; Gamage 2016; Roy 2017).

Supreme Audit Institutions (SAI) attempt to be in the vanguard of managerial reform, so they are likely to be among the first public sector institutions to incorporate digitalization into their work (Midgley et al. 2024). Public sector auditors furthermore respond to a private sector environment (Ahlenius 2000; Jeppesen et al. 2017) and there is widespread recognition in the private sector of the strengths of digitalization for auditors. However, the advantages of digitalization for auditors, which include, for example, access to and the ability to manipulate and work with

huge amounts of data, are also true for anyone trying to manage or hold to account the way that government operates today (Dunleavy and Margetts 2023; Guerrero and Margetts 2024). Auditors are therefore an important group to understand because they are trying to do a similar task to other sets of public sector managers but across the entire sector. The auditor is also a chief agent of accountability within the state, and consequently, their ability to use digital tools reflects whether accountability itself is becoming digital. Despite this, though, many studies of SAIs (the leading auditors for the public sector) suggest that they are not embracing technology at pace and that there is a lot of resistance within them to using it (Otia and Bracci 2022; Ferry and Midgley 2023; Volodina and Grossi 2024).

Consequently, our research question is why, despite the opportunities provided to them by the new technology and the promises it makes in terms of a transformed ability to comprehend the public sector, do the auditors not take the opportunity that digitalization affords? Carlsson-Wall et al. (2025) suggest that the answer to this question lies in the dynamics within the organizations themselves. This paper is based on that insight and seeks to understand why digitalization, despite its promise, has not been achieved.

To address this issue, the paper adopts the concept of regulatory space. Regulatory space was developed by Hancher and Moran (1989): They used it to describe the space which organizations and people inhabit. This concept has been adopted to describe the ways in which public sector audit interfaces with other parts of the public sector, both in local government (Ferry and Ahrens 2022; Ferry, Midgley, and Ruggiero 2023) and in central government with SAIs (Ferry, Hamid, and Hebling Dutra 2023; Midgley et al. 2024). Ferry, Hamid, and Hebling Dutra (2023) refined Hancher and Moran's (1989) description of regulatory space to make it fit better to the environment of the SAI: They described themes within the SAI's regulatory space of mandate (meaning the institutional setting of the audit), capacity (meaning the ability of the SAI to do the audit) and reporting (meaning the public or private articulation of the audit findings).

From examining the work on SAIs through regulatory space themes of mandate, capacity, and reporting, this paper articulates three lines of enquiry that help provide an answer to the overall question. The first of these lines of enquiry concerns whether SAIs are inhibited by their mandate or forced to adopt digitalization as a means to gain legitimacy within an ever-changing political realm. The second line of enquiry concerns the fact that while technology promises massive improvements to the capacity of the auditor, it also makes demands upon both the auditor and other bodies to adapt to it. The third line of enquiry concerns how far technology can influence the way that audit reports are written and prepared when the audiences and structures around audit reporting remain fixed and are hard to change.

These lines of enquiry are investigated using the UK's SAI, the National Audit Office (NAO). The NAO has been singled out before as a digital innovator among SAIs (Otia and Bracci 2022; Ferry and Midgley 2023) so presents an important case study for how digital innovation in SAIs might proceed. The authors carried out 30 interviews during 2021 and 2022, carried out observations and inspected documents from the NAO relating to digitalization and audit, including evidence from the NAO's most senior official, the Comptroller and Auditor General (C&AG) before parliamentary select committees on the topic. They did this using the themes of regulatory space to provide answers to the lines of enquiry described above.

Findings in this paper suggest that the NAO's work in digitalization has been determined by the contours of the regulatory space in which it operates. The NAO's mandate to audit was affected by digitalization: As government digitalized, the public sector auditor could not be left behind and the NAO, the paper will show, felt a continuous pressure to keep up with the private sector in terms of the effectiveness and efficiency of its audit. However, its mandate remains fairly unchanged. Similarly, though digitalization promises to offer far greater capacity to auditors in the future, the NAO, the paper shows, has been constrained both by its own capacity to take up the opportunity offered and by the capacity (and willingness) of government to allow it to audit digitally. Lastly, the paper demonstrates that the NAO has attempted to develop its reports using digital methods—for example, data visualization—but this development is constrained by the fixed nature of public sector reporting.

In Section 2 the paper will provide a literature review covering regulatory space and digitalization, and the potential impact of digitalization on SAI mandates, capacity, and reporting. This review gives rise to three lines of enquiry, which together explain the limits and opportunities for the SAI in digitalizing its audit. Section 3 will set out the methodology in terms of research case and methods. Section 4 will then theorize findings across mandates, capacity, and reporting. Finally, section 5 offers a concluding discussion.

2 | Literature Review

Academics have been attentive to how digital power may revolutionize the ways in which society operates, speaking, for example of a "new machine age" (Brynjolsson and McAfee 2014) and expecting huge disruption to workplaces and industries (Suskind and Suskind 2015; Schwab 2017). Danaher et al. (2017) and Yeung (2017) argue that the powers of algorithmic approaches to data are revolutionary—ushering in an "algorithmic age" through "algorithmic power".

Public sector audit is a good place to look for developments of digitalization. This is because public sector audit is at the heart of developments concerning public sector management as auditors have often seen themselves sitting at the vanguard of managerial change (Radcliffe 1998, 1999; Gendron et al. 2001, 2007; Ferry et al. 2015; Ferry, Funnell, and Oldroyd 2023; Midgley et al. 2024). Unlike many other parts of the public sector, auditors do not provide the kind of personal services which are harder to digitalize (Baumol 2012). Experts frequently forecast a revolution in private sector audit due to the technology (Suskind and Suskind 2015). Furthermore, as accounting and audit are central to the accountability of public services, understanding their digitalization allows us to grapple with questions about whether the public sector's governance as a whole is digitalizing (Dunleavy et al. 2006; Ferry

et al. 2018). Furthermore, there are few good quality empirical studies either of digitalization as a phenomenon in private sector audit (Appelbaum et al. 2018; Lombardi et al. 2022), in public sector accountability (Agostino, Bracci, et al. 2022) or in public sector audit, despite repeated calls for them (Mattei et al. 2021, 107; Rana et al. 2022; Ferry et al. 2022; Cordery and Hay 2024). There has been one general paper examining digitalization at all SAIs (Otia and Bracci 2022) and two which examine digitalization in specific SAIs, but they have specific foci either on a particular area of audit work (Ferry and Midgley 2023) or the internal dynamics of technological change (Volodina and Grossi 2024).

The literature review is divided into four parts. In 2.1, the paper sets out how our concept, regulatory space, enables us to map the contours of change in the SAI. In 2.2, the potential impact of digitalization on SAI mandates is considered. In 2.3, the potential impact of digitalization on SAI capacity is discussed. In 2.4, the potential impact of digitalization on SAI reporting is set out. These three parts (2.2, 2.3, and 2.4) give rise to three lines of enquiry, which together explain the opportunities and limits for SAI in digitalizing its audit.

2.1 | Regulatory Space and Digitalization

Different theoretical perspectives have been used to understand this change: For example, identifying institutional logic and institutional work (Federspiel 2015), spillover effects (Natalini and Stolfi 2012), the process of formalization of change (Mergel and Bretschneider 2013) or understanding digitalization through the cultural context of organizations (Meijer et al. 2021). However, Carlsson-Wall et al. (2025) suggested in a recent piece that to understand digitalization and its impact, scholars need to situate it within the organizational dynamics of the organizations they study. In this paper, the conceptual framework of regulatory space enables us to meet the challenge set by Carlsson-Wall et al. (2025).

Regulatory space was first suggested as a conceptual framework by Hancher and Moran (1989). Hancher and Moran (1989) argued that modern societies were involved in regulating the activities of their citizens. They suggested regulatory space was a suitable analytical tool to understand how this regulation was conducted. Firstly, they argued that as regulatory space was a space, it could be occupied by actors. Secondly, they suggested that these actors could include both minor and major actors. Thirdly, they argued that scholars could use the concept to distinguish between different regulatory spaces in different sectors. Fourthly, they suggested that the boundaries around each regulatory space could be studied.

Regulatory space has been seen as a useful construct for scholars who see fields like accounting as socially constructed (Young 1994; Canning and O'Dwyer 2013). Andon et al. (2015) built on these insights by suggesting that students of audit could analyze the development of the audit profession by examining how auditors occupied, drew boundaries around, and got authority over new spaces for audit. They specifically recommended that scholars use the concept to analyze the intersections between audit and the public sector (Andon et al. 2015). Other scholars have since recognized and imported the concept of regulatory space into the study of local and central government audit (Ferry 2019; Ferry and Ahrens 2022; Ferry, Hamid, and Hebling Dutra 2023; Ferry, Midgley, and Ruggiero 2023; Midgley et al. 2024). These studies mostly focused on the ways in which the regulatory space of public sector audit developed under political and ideological pressure, rather than examining in detail how a technological change could affect and be affected by the regulatory space of public sector audit. The latter is the topic of this study.

To this end, regulatory space needs to be described. Hancher and Moran (1989) mapped in their seminal research the dynamics between key actors; their financial resources, information, and expertise; their objectives and priorities for influencing regulatory actions; the institutional structures shaping regulatory interactions and outcomes; and the observable strategies and tactics for navigating regulatory space. Ferry and Ahrens (2022) adapted these themes for local government audit in the UK, and these themes were also used by studies examining local government audit internationally (Ferry, Midgley, and Ruggiero 2023).

Ferry, Hamid, and Hebling Dutra (2023) further adapted these themes for an international comparative study of the 196 members of the International Organization of Supreme Audit Institutions (INTOSAI), involving leading policymakers in the design and analysis of the theorizing and finding that the main aspects of the regulatory space of SAIs were mandates, capacity, and reporting. These themes were then used for a historical study of the UK NAO, showing their suitability for analyzing longitudinal change (Midgley et al. 2024).

In the emerging streams of regulatory space research into public audit and SAIs, these themes are broadly present but framed with particular relevance for audit. Thus, Hancher and Moran's *actors* were typically narrowed to specific actors, namely, *executive*, *legislative*, *public auditor*, *audit regulator* and *the people*. *Resources* were thematised as *auditor independence* by public audit research (Ferry 2019, 1) and *capacity* (*auditor independence and resources*) by SAI research (Ferry, Hamid, and Hebling Dutra 2023). Here, auditor independence was treated as a resource because it could significantly affect auditors' strategies and assertiveness during audits. Hancher and Moran's *objectives and priorities* found expression in public audit research as *democratic accountability and inspection* and *public service improvement*. In SAI research it has not been an explicit focus, perhaps on account of the national legal specificities of SAI objectives. Hancher and Moran's concerns with *institutional structures* were reflected in the public audit research discussion of *cohesiveness* versus *fragmentation of regulatory space* and in the ways in which SAI research has focused on *organization*, which encompassed *SAIs' mandate*, *accreditation*, *and institutional capital* more broadly. Since part of the SAI mandate is to act independently of ministers and their departments, it turns out that auditor independence straddles Hancher and Moran's two categories of resources and institutional structures. Independence is a practical resource in the process of audit, but it is also an important aspect of the audit mandate and, thus, a key element of institutional structures. The institutional mandate creates a resource for audit practice. Lastly, the theme of *strategies and tactics* in regulatory space took the shape of *audit scope* and *audit*

TABLE 1 | Regulatory space, public audit and SAI thematic continuities and overlaps.

Regulatory space research (Hancher and Moran 1989)	Public audit research (Ferry 2019; Ferry and Ahrens 2022)	SAI research (Ferry, Hamid, and Hebling Dutra 2023; Midgley et al. 2024)	This paper
Actors	Assumed to be usually: Executive, legislative, public auditor, audit regulator, the people	Assumed to be usually: Executive, legislative, public auditor, audit regulator, the people	Not a focus of this study
Resources	Auditor independence	Auditor capacities (independence & resources)	Auditor capacities (including independence)
Objectives and priorities	Democratic accountability; inspection and public service improvement	Assumed to be usually related to specific national legal context	Auditor mandate, legislation and political position
Institutional structures	Cohesiveness versus fragmentation of regulatory space	Organization of audit contexts (institutional capital, accreditation, mandate)	Organization of audit context (especially mandate, including independence)
Strategies and tactics	Audit scope & audit market competition	Audit scope (SAI activities, outputs/products, reporting practices)	Audit scope (especially products and reporting)

market competition in public audit research. In SAI research, it was also conceived of as *scope* with particular emphasis on *SAI activities*, *outputs/products*, and *reporting practices*.

Table 1 visualizes these thematic continuities and overlaps between Hancher and Moran's work, public audit research in general, and SAI research specifically, and adds the conceptual foci of this paper.

Digitalization is seen as the major new challenge in both the public sector and auditing literatures. For example, Arnaboldi et al. (2017, 772) argue that the "role of accounting, accountants, social media and big data within the digital revolution" is "the key question of future research". If this, and other declarations about the effects of digitalization on society as a whole are true, it should affect SAIs and their regulatory space. Current studies suggest though that there has been minimal effect (Otia and Bracci 2022).

This paper assesses the impact of digitalization through examining its effect on every element of the regulatory space described above. In particular, it covers the aspects of regulatory space—mandates, capacity, and reporting—that international research comparison has deemed most pertinent for SAIs (Ferry, Hamid, and Hebling Dutra 2023). Thus, parts 2.2, 2.3, and 2.4 cover the mandate, capacity, and reporting of the SAI and how they could be affected and have been affected by digitalization.

2.2 | The Mandate of SAI and Digitalization

The mandate of an SAI derives from the legislation which gives it both existence and purpose (Dewar and Funnell 2017). SAIs spend time considering how their mandate through legislation limits them, and often other actors seek to use that mandate to confine the SAI's activity (Dewar and Funnell 2017; Midgley et al. 2024).

The SAI exists within a network of other institutions that shape what financial scrutiny or auditing the public sector looks like (Midgley 2019; Ferry, Honeysett, et al. 2021; Ferry et al. 2024; Polzer and Siewald 2022; Midgley et al. 2024). The SAI also sits within a constitutional framework which incorporates institutionalized ideas about the rights of the legislature versus the executive (Funnell 2008; Ferry et al. 2022) and auditors often see themselves as upholders of those rights and powers (Pallot 2003; Funnell 2003).

Accounting, performance measurement, and wider calculative practices are socially constructed (Hopwood 1984; Steccolini et al. 2019). Constitutional thinking about the purpose of audit evolves (Morin and Hazgui 2016; Midgley et al. 2024). More importantly, SAIs have aligned with a broader cultural sense of what "good management" looks like, supporting, for example, New Public Management (NPM) through the 1980s to 2020s (Power 1997; Radcliffe 1998, 1999; Gendron et al. 2001, 2007; Lapsley 2009; Aucoin 2012; Morin and Hazgui 2016; Parker et al. 2019). International expectations of "good audit" or "good management" can also drive the mandate of an SAI in new directions (Free et al. 2020). In addition, developments in private sector audit can shape the way in which public sector auditors interpret their mandate (Hay and Cordery 2021; Midgley et al. 2024). They see themselves often in competition with private sector auditors (Ahlenius 2000; Jeppesen et al. 2017) and competition in the private sector is driving digitalization (Porter and Heppelmann 2014).

Public administration scholars have detected that digitalization has reshaped what good management means inside the sector. Dunleavy et al. (2006) were one of the first to anticipate what

they described as "a whole complex of changes, which have IT and information-handling changes at their centre" and argued that these changes, the "advent of the digital era", represented "the most general, pervasive, and structurally distinctive influence on how governance arrangements are changing in advanced industrial states" (Dunleavy et al. 2006, 478). Dunleavy et al. (2006) argued that digitalization reintegrated government and broke down the boundaries created by the NPM phase of public sector reform in the 1980s, centred government around a needs-based holism, and changed the way in which organizations were conceptualized—they became their websites. The suggestions of Dunleavy et al. (2006) were picked up in further work which identified a new stage of this digital revolution occurring from 2010 onwards. Dunleavy and Margetts (2013) identified a quasi-paradigm shift in the way that public services were delivered, a sentiment echoed by Andrews (2018). Cordella and Tempini (2015) have described this as a further step in the evolution of the bureaucratic model towards making bureaucracy more integrated, efficient, and accurate in its devotion to public needs. Ansell and Miura (2020) agree, suggesting that technology can enable distributed and decentred action. The technological revolution is forecast to affect private sector management too (Schwab 2017). The impact of technology is not one-size-fits-all: As Di Giulio and Vecchi (2023, 134) found, "ICTs influence on the distribution of power and knowledge both within and across the organizations of a given policy field mostly depend on their operational characteristics". Whilst digitalization in the public sector is not universal or universally revolutionary (Greve 2015; Gamage 2016; Roy 2017, 554), scholars have found real examples of this radical digitalization happening in practice (Hu and Kapucu 2016; Wukich et al. 2019; Whitford et al. 2020; Li et al. 2020).

It is not just in the public sector that digitalization is felt as a major driver of change. SAIs are also linked to the audit industry. Some commentators suggest that audit and accounting need to adapt to technological change to maintain their "relevance and quality" (Manita et al. 2020, 8; Barrett 2022). Accounting standards and the regulators who administer them are themselves in the process of potential change due to digitalization (Salijeni et al. 2019; Rowbottom et al. 2021). This regulation plays an increased role in public sector audit (Midgley et al. 2024).

If, as Millo et al. (2024) argue, it is the external legitimacy of digital tools that provides a compelling argument for their use, then the increased digitalization of the public sector itself must prompt SAIs to consider how they can digitalize their own work, so they can retain their hard-won reputations in public sector management. Furthermore, if the task of government and its potential abuses become radically different in the new digital realm, then the task of holding government to account changes, too (Rogge et al. 2017; Andrews 2018; Bracci 2023).

The discussion thus gives rise to our first central line of enquiry concerning the impact of digital technology upon the regulatory space of public sector audit for the SAI. On the one hand, the institutional structures surrounding the SAI, both in terms of formal law and the informal conventions of the constitution, remain semi-fixed. On the other hand, the evolution of public management towards more digitalization prompts both a desire to keep pace with the public sector to retain legitimacy as an advisor on good management and requires a development in accountability.

2.3 | The Capacity of SAI and Digitalization

The promise of digitalization for the capacity of auditors, including public sector auditors, is immense. Public sector auditors claim legitimacy because of their expertise, which means that advances in digital technology have an innate attraction to them (Schelker 2012). There are three huge opportunities that are often cited in the literature: Big data, blockchain, and artificial intelligence (AI) (Atayah and Alashatar 2021, 118, 119).

Big data has been described as an almost limitless opportunity for accountants (Appelbaum et al. 2017). This analysis applies to accountants as a whole who are facing a future where they work with "large interconnected datasets, allow[ing] for more rapid analysis of large amounts of data, providing the potential for forward looking projections about those data" with even elements of the audit being produced "on-demand" (Lombardi et al. 2015, 11; Krahel and Titera 2015). Indeed, academics have examined the role of big data with respect to audit in particular. Manita et al. (2020, 8) identify five areas of progress that big data would support: focussing on value, extending the audit offer, improving quality, expanding competence, and enabling a culture of innovation. Accounts furthermore will be produced against a background of more and more data being published by governments (Gamage 2016). For Salijeni et al. (2021) big data allows auditors to automate more and more processes, to communicate their findings better, and change the nature of relationships within the audit firm. Auditors claim that it particularly helps them deal with the profusion of data within government (Volodina and Grossi 2024). This analysis does not just apply to accountants but to the public sector as a whole with some commentators calling for all civil servants to become data scientists (Guerrero and Margetts 2024).

Blockchain will, according to its advocates, help revolutionize audit. Lombardi et al. (2022, 1534) suggest that there are three directions in which blockchain might revolutionize audit: it could be "a tool for audit professionals to improve business information systems to save time and prevent fraud", could lead to "smart contracts enabling Audit 4.0 efficiency, reporting, disclosure and transparency", and could be "a springboard for improved corporate governance… and new venture financing". Rozario and Vasarhelyi (2018) argued that the technology could, if regulatory barriers are overcome, change the nature of audit.

In the case of artificial intelligence, large benefits have also been claimed from this technological innovation for audit. For example, Baldwin et al. (2006, 82) suggested that auditors could move beyond using expert systems to conduct testing to using other techniques like fuzzy systems, genetic algorithms, and neural networks. Moffitt et al. (2018) suggest that there is similar revolutionary potential for audit in robotic process automation, which can automate some of the more routine work in an audit. Even warnings about the abilities of artificial intelligence are concerned with how it could unjustly revolutionize society through the misuse of new advances in the capacity of accountants to scrutinize and understand data (Gendron et al. 2024).

However, whilst audit technologies offer the promise of radically reconfiguring public sector audit, there is some doubt whether they are doing this. This doubt is manifest both in the wider audit industry and in public sector audit itself. In private sector audit firms, there are issues integrating technological experts with teams, and some of those tensions have been observed in the public sector (Bauer and Estep 2019). Scholars have argued that technology might undermine the culture of audit firms and the socialization of young auditors into the profession (Siamiolo et al. 2024). Similarly, doubts have been expressed about the penetration of these techniques into SAIs. Otia and Bracci (2022) suggested that SAIs often do not understand or have appropriate strategies for digitalization. Ferry and Midgley (2023) demonstrated that there were significant barriers in terms of employee capability to be overcome before data analytics could be embedded into financial audit. Volodina and Grossi (2024), in a broader study focused on the Norwegian SAI, argue that the workforce within the audit institution is divided on digital change between hope and fear about its potential.

The auditor also is surrounded by other institutions whose data they will have to use to perform audits. Access to this data has always been a constraint upon the SAI's ability to conduct their work (Midgley et al. 2024). In the digital arena, there is already evidence that SAIs and those they audit constrain and stimulate each other's adaptation of the technology (Lino et al. 2023). There are concerns that the use of technology and remote auditing might affect auditors' skepticism (Aquino et al. 2022). To be useful for many of the techniques discussed above, data has to be cleaned and made readable before it can be used: The challenge for those interacting with it is, therefore, whether the capability to do this exists (Kallinikos 2005; Otia and Bracci 2022). The NAO itself believes that there is little evidence about which digital change programmes secure results, and which do not (Comptroller and Auditor General, 2021, 42).

The discussion gives rise to our second line of enquiry concerning the regulatory space of public sector audit. On the one hand, the literature suggests that the capacity improvements from digital innovation should revolutionize the capacity of SAIs to conduct their work, as has been described sometimes in the private sector. However, on the other hand, plenty of studies show both that this is not happening and suggest internal and external constraints that explain that reality.

2.4 | The Reporting of SAI and Digitalization

Our third line of enquiry concerns the potential of digitalization to revolutionize reporting. Digitalization has already been used to advance reporting of government data. For example, during the COVID-19 pandemic, the use and publication of government data about the pandemic helped construct trust and accountability (Ferry, Hardy, et al. 2021; Ferry et al. 2024). Auditors in particular may find that digitalization creates an "audit society on steroids" (Carter et al. 2015, 1207).

The revolutionary potential of publishing data in new forms has been a commonplace for scholars of accounting. Andon et al. (2015) recognized that new emerging digital spaces enabled a democratized form of social capital to emerge. Agostino, Saliterer, et al. (2022) argued that digitalization offered the possibility of more pluralistic and horizonal accountability replacing the vertical accountabilities of the past. For this reason, Bhimani and Willcocks (2014) suggest that the outcome of big data changes particularly will amount to no less than a "transformation of accounting information". There is little resistance from citizens to such digital reporting (Prokop and Tepe 2022). Digital interfaces may indeed lower the administrative costs for citizens of engaging with public services and the accountability for public services (Herd and Moynihan 2019). As accounting systems affect the nature and definition of accountability, transparency and eventually democracy, the implications of this potential change to reporting are huge (Hood 2006; Heald 2012; Ferry and Midgley 2024). There are different ways this might happen. Real time auditing where auditors report as government agencies do their work would enable instant accountability (Rabin and Peled 2024). Rogge et al. (2017) argue for more citizen centred reporting, enabling reports to be directed to a specific user's needs for them. Margetts and John (2024) offer a vision in which citizens can become much more active as consumers of democracy.

The revolutionary potential is more likely to be realized because auditing itself is not static. SAIs have generally moved beyond reporting simply to the legislature: auditors acknowledge and use new channels to report through, for example, by interacting with the media (Bringselius 2014). The concept of reporting can be expanded in another direction too: Instead of reporting being a single moment in time, SAIs increasingly look at reporting as a "more continuous dialogue" with the auditee (Lonsdale 2007). These changes and the variety of purposes both geographically and over time for SAI audit reporting suggest that audit reports are context and mandate dependant (Pierre and De Fine Licht 2019; Ferry, Hamid, and Hebling Dutra 2023; Midgley et al. 2024).

However, there are significant constraints on how far SAI reporting can change. The most important of these constraints relate to their audience who may reject reports whose digital language they do not understand (Chua et al. 2021). However, the interactions between citizens or users of information and those who provide it are not straightforward (Arnaboldi and Lema 2022). Publishing data digitally after all is not enough: The public must be able to access and use it (Harris et al. 2011). The UK's experience with armchair auditors does not suggest that digital reporting on its own is a panacea (Ferry et al. 2015; Ferry, Midgley, Murphie, et al. 2023). These constraints in terms of the capacity of the audience to absorb new digital reporting are not the only constraints on reporting. As with the mandate, the SAI's reporting is described in legislation, giving them certain rights (such as immunity from court action): This legislation too thus acts as a potential constraint on the way that the SAI reports (Midgley et al. 2024).

Our third line of enquiry therefore concerns reporting. On the one hand, the literature suggests that reporting should be revolutionized by the ability to publish data digitally. There are constraints, though, upon this, largely due to the ways in which

audiences absorb information and the legalities which inform SAI reporting. Consistent with that, Otia and Bracci (2022) noted that in their sample, most SAIs focus on digitalization as a capacity enhancement rather than on exploiting its wider potential. On this basis, our final line of enquiry considers why SAI reporting lags so much behind both the capacity to report and the desire for new forms of reporting to emerge.

3 | Methodology

3.1 | Research Case

The NAO is the SAI of the UK and is run by a senior official, the C&AG. The NAO was established in 1983 by the National Audit Act. Prior to the 1983 Act, the UK had a SAI-the Exchequer and Audit Department. The NAO was created for a mixture of reasons. In Parliament, MPs were concerned about the rise of an overmighty executive and saw the creation of a public sector auditor as a mechanism to bolster the power of Parliament against that executive (Ferry and Midgley 2022). The NAO was created though at the same time as the Thatcher government proposed a series of NPM reforms to the public sector and consequently has been linked to that reform programme too (Lapsley 2009). The 1983 Act made the NAO independent of both the Government and Parliament and granted it the power to conduct examinations of the economy, efficiency, and effectiveness with which government services are run.

The contemporary NAO follows this mandate precisely. It conducts three main types of work: financial audits of the accounts of the main government ministries (usually referred to as "departments") and other government bodies, value for money examinations of the economy, efficiency, and effectiveness with which public money is spent, and investigations into particular instances of failures around economy, efficiency, and effectiveness. Mostly, these reports are laid before the House of Commons and consequently acquire parliamentary privilege (a legal protection that all proceedings of Parliament have). In 2015, after the abolition of the Audit Commission (which prior to 2015 conducted both value for money and financial audit on local government), the NAO also acquired the responsibility of conducting national studies on local government (Ferry et al. 2015; Ferry, Midgley, Murphie, et al. 2023). The NAO acquired the rights to audit other organizations including the BBC and Bank of England in this period (Midgley et al. 2024). The NAO performs this work to mainly support the Public Accounts Committee in the House of Commons, but it also supports other select committees and has attempted to develop its capacity to explain complex information as well as provide reports and audits (Midgley 2019).

The NAO is autonomous in managing its own activities. It does not need to respond to central government initiatives and is held to account for how it spends money by the Public Accounts Commission (in contrast to the Public Accounts Committee which uses the NAO's reports to scrutinize government but has no role in holding the NAO itself to account) (Ferry and Midgley 2022). The NAO has chosen voluntarily since the 2000s for some of its audits to be reviewed by the private sector regulator of audit in England. The exact identity of this body has changed over time (Midgley et al. 2024). This means that initiatives like digitalization within the NAO respond to its needs and reaction to developments in the outside world. Organizationally, the NAO is structured around teams which face the major departments or cut across several issues. Each departmental team has a value for money director and financial audit director: These lead teams of specialist auditors in each discipline are either trained in accounting or in a relevant discipline to value for money (e.g., economics, social policy etc.). Value for money and financial auditors collaborate across disciplines and share intelligence. There are centres of expertise within the NAO that focus on topics of interest across government including issues like commercial policy or the government's approach to IT. There is also a central unit, the Practice and Quality Team, which supports the main functions of the office—providing technical support to the value for money teams and the financial audit teams. It is this Practice and Quality team that leads on the development of the audit practice, including examining whether and how IT systems should be used to strengthen audit. In the late 2010s, the NAO established a series of teams that worked directly on using IT within audit. These included specific teams working on subjects such as financial audit data analytics and modeling.

The NAO is an important case study for a project assessing how digital change can progress in SAIs because in the only recent comparative study of SAI adoption of digital change (Otia and Bracci 2022), the NAO's work on digitalization was mentioned but not described or analyzed in detail.

3.2 | Research Methods

The field research at the NAO was conducted through interviews and documentation review. The researchers interviewed 18 members of staff at the NAO and 10 members of staff who had left the NAO at the time of the interview but were involved in the issues discussed within the article, plus two members of Parliamentary staff. The interview questions had been determined from literature and pre-discussions with a small group of NAO staff. The interviews took around 60 min each and were recorded. The interviews were semi-structured. They were conducted around a common set of topics identified at the start of the research. The recordings were then transcribed, and the authors have used the transcriptions in the article. Brief further meetings or email exchanges were organized for follow-up questions.

A breakdown of the 30 interviewees by different categories is provided in Table 2, which gives the current employment status of the interviewees.

TABLE 2 | Employment status of interviewees.

Employment status	Number of interviewees
Current NAO employees	18
Former NAO employees	10
Members of parliamentary staff	2

Within the NAO, interviewees performed different roles concerning digitalization that are summarized below in Table 3.

One of the authors worked at the NAO between 2008 and 2021 and was familiar with the changes, whereas another of the researchers has worked externally with the NAO closely and has a long experience of the organization as well as having formerly been a senior local government and civil service official with direct experience of IT change programmes in that context. The third author has not worked to any great extent with the NAO recently and so provided a completely independent perspective on the data.

TABLE 3 | Role of interviewees at the NAO (For the purposes of this table, a senior NAO leader is a director or above).

Participant number	Focus of NAO work	Senior or central team
1	Financial audit	Central team
2	Value for money	Senior manager
3	Value for money	
4	Value for money	Central team
5	Value for money	Central team/ senior manager
6	Value for money	
7	Value for money	
8	Value for money	
9	Value for money	Central team, senior manager
10	Parliament	
11	Financial audit	Central team
12	Financial audit	
13	Financial audit	Central team
14	Parliament	
15	Value for money	Central team
16	Financial audit	Central team
17	Financial audit	Central team, senior manager
18	Value for money	
19	Financial audit	Senior manager
20	Value for money	Central team
21	Financial audit	
22	Financial audit	Central team
23	Financial audit	
24	Value for money	
25	Financial audit	Central team
26	Value for money	Central team
27	Financial audit	
28	Value for money	
29	Value for money	Senior manager
30	Value for money	

Interviewees were selected based on the authors' experience of the NAO and also on the feedback of previous interview subjects who suggested further contacts. One of the authors, as a former member of NAO staff, was able to sense check the findings through informal conversations with former colleagues.

Documents including NAO annual reports, the annual NAO strategy, evidence sessions with the Public Accounts Commission, and other publicly available documents were reviewed to triangulate the evidence.

The authors were able to triangulate findings through the interview evidence, the documentary evidence, and their own experience of the NAO and other organizations to come to their conclusions. The research relationship with the NAO was maintained during the process of revising the paper for publication.

In line with qualitative research, after the data was collected, it was considered through multiple iterations by the authors both independently and together before organizing interview sections into themes (Ahrens and Chapman 2006). These helped address existing debates in the literature on aspects of the SAI regulatory space of mandate, capacity, and reporting (Ferry, Hamid, et al. 2023). The authors particularly assessed the data for inclusion into these themes, paying attention to how they worked before, during, and after digitalization changes that affected public audit and associated practices.

4 | Findings

In this section, we set out the findings from our fieldwork against lines of enquiry for the three categories of regulatory space: Mandate, capacity, and reporting.

4.1 | Line of Enquiry 1: The Mandate

The first line of enquiry concerned how SAIs reconcile the institutional structures surrounding the SAI mandate, both in terms of formal law and the informal conventions of the constitution. In this section, the paper analyzes the reasons this line of enquiry exists and finds a tension between the SAI's role as an advisor and its constitutional role.

The role as an advisor requires the NAO to be seen to be at the forefront of change. The NAO recognized that government in this period wanted to become more digital (Comptroller and Auditor General 2021, 2023, 2025). Consequently, NAO staff understood that to have authority and power over the government and the direction of that change, the NAO itself had to digitalize. Interviewees made this point again and again: Participant 4 told us that "the amount of data that government is collecting has grown; in modern government, data is

knowledge, data is power" (Participant 4). Participant 3 argued the NAO's credibility depended on ensuring that "we understand the data as well as anybody". Participant 25 told us that without digitalization the NAO "would have been left behind in the future." In hiring decisions, new staff were asked by senior staff at the NAO "in three years, can we be the best in Whitehall at this?" (Participant 20) (Whitehall here is a word which encompasses the civil service, the NAO and Parliament). One way our interviewees discussed this was to suggest digitalization was modernisation: So, Participant 9 responded to initial interview questions by saying "when you're saying digitalization, that's kind of like being modern" and Participant 29 described digitalization as "modernizing". All this rhetoric made the case that in Participant 9's view "you always have to innovate": staying still just was not a possibility. Digitalization therefore was part of the rhetorical case for the NAO being the advisor of the government: the NAO wanted to be seen as an "an exemplar organization" that others would want to follow or seek counsel from (Participant 6).

Being seen as an exemplar organization is one way that the NAO sought to protect its role as an advisor, but it was also conscious that there were potential competitors out there—especially private sector audit firms. Digitalization was also driven by a desire to keep pace with those firms. Participant 17 told us:

> We're trying to track [the private sector] so we are comparable to them, the organisations we audit if they weren't audited by the NAO would be audited by a big four firm and indeed some of those organizations [like the BBC] that we now audit have historically been audited by a big four firm, so we are always trying to track what they do.

Participant 22 saw private sector competition as a crucial driver for the NAO of its digitalization: "I think it was driven by looking at private competitors, sorry, private sector auditors and seeing what they were doing and a drive to emulate what was perceived as best practice". Notice that Participant 22 even described the private sector auditors as "competition". Similarly, Participant 21 said "the NAO felt it had to digitalize in order to demonstrate its value and that it was keeping up with the firms" (Participant 21). This was particularly true in areas where the NAO had recently taken on an audit that was previously done by the private sector like the BBC (Participant 25).

If the need to digitalize was predominately driven by the NAO's mandate to act as an advisor to government, then its constitutional role was more ambivalent. Participant 9 made this clear to us, saying that regardless of technological change, the NAO's mandate was to be a public auditor and, in the UK, "public audit is a service that is really known in the UK in two ways: Value for money/performance audit and financial audit. We need to start from there" (Participant 9). Both of these types of audits were created long before digitalization. Many NAO staff argued that their particular audits did not have a digital mandate. For example, Participant 24 said:

> I've been going to a lot of presentations and seminars about all kinds of data visualisation and presentations on the use of our own web scraping, and big data, and looking at social media... but it's just not featured in the core elements of any study I worked on
>
> (Participant 24).

The core elements of a VFM study were the things that should determine the use of digital technology, not the other way around. This was not atypical: A data manager working on value for money pointed out to us that "some VFM studies are less suitable for data analytics and data science techniques and the use of data more generally than others" (Participant 5). Similarly, on financial audit, Participant 17 told us "Our regulator has a problem with Artificial Intelligence", that meant the NAO's mandate could not include using Artificial Intelligence in its financial audit (Participant 17). Participant 15 told us the degree of digitalization depended upon the type of work done: Value for money and financial audit are "on very different trajectories with regard to digitalization because they have very different needs". As Participant 9 implied, the mandate of the NAO constrained the digitalization that should be used.

There were areas though where the NAO's constitutional mandate did help push digitalization forward. In financial audit, regulation pushed the NAO to think more about data (Participant 17). NAO staff in financial audit told us that "IT was integral to my work" (Participant 4). In the mid-2010s, the NAO acquired the value for money audit rights to local government: Participant 3 told us that:

> The data involved isn't always huge on the VFM side, particularly if you are looking at a single programme like the procurement of an aircraft carrier, but once we got given audit rights in local government, where you have 300-400 local authorities, each with their own time series of different data, you've got a million different data cells to understand and integrate together.

This interviewee's point was that the purpose of the audit should drive the use of digital technology, not the other way around.

Constitutionally, the NAO is held to account by Parliament for its use of money: MPs both wanted the NAO to be more efficient but also the NAO was aware that overinvestment in technology could look like extravagance. The NAO appealed to MPs to support digitalization because of efficiency gains. Michael Whitehouse, the Chief Operating Officer of the NAO, told the Public Accounts Commission in 2016 that savings of £4 million "is made possible as we make greater use of technology" (Public Accounts Commission 2016). Several of our participants identified reducing the costs of audit and especially the people cost as a crucial factor behind the adoption of technology internally. Parliamentary officials noticed that the NAO's case for technology was based upon a claim of efficiency: "the NAO wanted to try and show itself leading the way and being efficient" (Participant 14). However, on the other hand, some within the

NAO were concerned that Parliament should not see the NAO overinvesting in technology, to get ahead of the competition (Participant 19).

On the one hand, the pressures on the NAO to maintain its position as an expert advisor, against the context of possible private sector competition, gave an impetus to digitalization. So did demands from MPs for efficiency savings. On the other hand, the NAO's digitalization was limited by the nature of its work.

However, this was only one side of the rhetoric justifying digital change: A rhetoric of increased audit quality was also discernible in the NAO's thinking. Participant 27 noted that towards the second half of the 2010s, the emphasis in the NAO switched to audit quality: "More recently, the focus has been on consistency leading to improving audit quality and it's actually made efficiency much worse" (Participant 17).

4.2 | Line of Enquiry 2: Capacity

The second line of enquiry concerns the fact that the literature suggests that the capacity improvements from digital innovation should revolutionize the capacity of SAIs to conduct their work, as has been described sometimes in the private sector. This is echoed by practitioners: Gareth Davies (C&AG since 2019) commented that technology offered the "clear potential for reducing the time taken for routine tasks, [and] augmenting the work of skilled experts"—considerations which could both be applied to public sector audit (Comptroller and Auditor General 2025). However, on the other hand, plenty of studies show both that this is not happening and suggest internal and external constraints which explain that. In this section, we firstly investigate ways in which the NAO's capacity was enhanced by digitalization. Then we discuss the barriers to them making use of this additional capacity: Including barriers relating to the nature of audit, senior management, staff and the rest of the civil service.

The NAO's use of new technology was driven by a genuine issue relating to capacity. As Participant 11 put it to us:

> I do not believe you can conduct a financial audit of an organisation with 60 million transactions without using data analytics.

The opportunity promised by an audit that could go further and even extend to analyzing every transaction within a department to "give you greater assurance" than testing a sample of transactions was appreciated by NAO auditors (Participant 13). In particular, Participant 13 shared with us that the NAO's plan was to automate some audit testing in the next 5 years. Senior management were aware of the possibilities of both artificial intelligence and blockchain for the capability of the auditor (Participant 9).

The NAO had made some strides in improving capacity to improve its analysis and storage of data. Data analytics were used by the NAO, where they could be used, to improve the auditor's capability to identify issues: for example, rather than having an auditor scan pages of transactions on excel, a data analytics package would identify anomalies for them (e.g., journals posted at weekends) minimizing the chance of mistakes and preserving human effort for other tasks (Participant 13). Other improvements to the NAO's capacity were noted, including greater ability to store and transfer data from a client to the auditor, automation of reconciliation testing (e.g., between the trial balance and general ledger) and the creation of applications that would analyze a set of accounts for the auditor (Participant 27). Participants 1 and 3 argued that value for money audit, in a data rich area like local government, was just not possible without data analytical tools. Technology led the NAO to begin "raising our ambition" in terms of what audit could achieve (Participant 20). Technology enabled the NAO to examine the way that government itself was modeling changes within society that effected its policy outcomes (Participant 20). Participant 28 noted the potential that techniques like web scraping offered to enhancing the capacity of value for money auditors. This potential was realized in a study on government guidance (National Audit Office 2017) and the NAO developed a back-catalogue analyzer so that it could examine its previous reports and check previous findings and recommendations against current findings (National Audit Office 2019), enabling the NAO for the first time to systemically provide Parliament and Departments with evidence about the lessons it had identified in the past. In Parliament, there was a consciousness that technology investment was focussed on improving the NAO's capability through "boosting the power of their audit" (Participant 14). Lastly, during the pandemic, remote auditing was only possible due to the fact that the NAO was able to use technology to continue its work.

However, there were significant barriers to the introduction of technology stimulating audit capacity. The first was simple: Whilst technology could boost capacity in some areas, it would not in others: Participant 30, an experienced financial auditor, told us that "there's only a certain amount that technology's going to do for you. It isn't really going to remove the need to think from audit." His sentiments were echoed by others especially in value for money.

A second and major barrier to the introduction of technology and the digitalization of the NAO were the staff of the NAO. For example, Participant 1 explained to us that prior to 2017, data analytics were being used "mainly in value for money studies where there were individuals who had an interest in data". Many audit staff were not aware of how their capacity could be increased by digitalizing their work: For example, an experienced value for money practitioner confessed to us that "I think most teams and probably me included probably don't realize what can be done actually" (Participant 28). There were deeper problems though especially when staff could not keep pace with the change brought in through digitalization. As Participant 23 told us:

> I'm genuinely horrified at the times I actually would end up with an audit lead in tears because they just couldn't get it. To me, there's something very wrong with your system if you've got people literally in tears because they can't make it work and they've been told they have to.

This emotional reaction might not be as visceral for all staff; but others spoke of digital change as something that happened to them rather than with them, or in the words of participant 27, "My role is in experiencing the impact of digitalization".

If a lack of capacity at the staff level could set digitalization back, then a lack of capacity at senior levels could also damage the progress of digitalization. A digital innovator within the NAO argued to us that, in their view, on occasions "the NAO doesn't have the vision and the confidence at a senior level" to pursue digitalization (Participant 11). The NAO itself identified "find-[ing] senior leaders who get it" as a key facilitator of digital change (National Audit Office 2019). When leadership sponsorship faded or failed to achieve its promises, experts in digitalization tended to move on: Several of our interviewees left the organization for just this reason (Participant 11). A lack of senior engagement in communicating change undermined the morale of those who were struggling to implement it, too (Participant 23). Furthermore, a lack of senior management attention could lead to teams who had been centres of excellence in digitalization breaking up (Participant 2).

Internal capacity though is only one side of the capacity to digitalize, with the NAO heavily dependent on its audit clients to present it with information that could be analyzed, causing issues. This had two facets: Firstly, could the clients produce the data required by the auditor and, secondly, would they permit the auditor to use that data?

Regarding the first issue of whether the clients could produce the data required by the NAO, the C&AG, Sir Amyas Morse, put this to the Public Accounts Commission in 2017:

> If you have good quality data, then you can do big-data analysis and examine the whole thing. If you are confident that the data is above a certain level, then that is an effective way of doing it. The problem, in some of the public sector, is that the data isn't at that level. For that same reason, we have had difficulty in adopting a controls-based approach over time. It is just that the basic data wasn't very good—and, in parts of the public sector, still isn't very good
>
> (Public Accounts Commission 2017).

Morse's point was one that many of our interviewees repeated. Participant 21 told us that whilst the NAO's financial audit was becoming more reliant on big data, that approach could not be universal as there were "these real problem clients where you got a really chaotic ledger" and there such approaches "were not very useful". Participant 4 agreed and expanded that to the whole of government: "part of the problem, the NAO's problem, is also caused by clients who don't necessarily understand their own systems". A lack of capacity among the NAO's staff and in clients interacted: as participant 22 explained to us "digitalization requires a fundamental re-orientating of the audit process around being data driven, and that is really hard for people to get their heads around as it requires them to have more detailed conversations with their clients for one about their data".

The second issue, whether departments would allow the NAO access to their data, was also cited. Participant 17 emphasized that the NAO was currently extracting client data and doing work on it on its own systems:

> My view is we probably get to this place where we can run software on client systems because if you want real-time auditing, we're going to have to do that, but the trouble is that the departments will be very sensitive about both the data protection and cyber security issues that arise from that.

Lurking behind this comment is the memory of data loss issues in the 2000s, when the data of child benefit claimants in the UK were lost in transit between the tax authorities and the auditor.

The second line of enquiry therefore results in a tension between the enhanced capacity technology promises and the auditor's capacity to use it. On the one hand, digitalization offered an enhanced ability to the auditor to automate tasks and understand their departments. However, this progress in capacity relied, as has been argued, on staff and departments understanding, being willing to use, and being able to use the technology. Consequently, in terms of capacity, progress was incremental rather than revolutionary (Participant 17).

4.3 | Line of Enquiry: Audit Reporting and Scope

The third line of enquiry concerned the suggestion from the literature that reporting should be revolutionized by the ability to make data more transparent digitally and to make it more specific for their audience. There are, however, barriers in the constitutional status of the NAO to developing reporting.

The NAO made data more transparent digitally through arranging it in new ways. Firstly, they did this through just publishing more numerical data. A new C&AG who arrived in 2009 gave this new impetus. He demanded "a crunchy, pointed, short, punchy report that says the department has spent, for example, £200 million on opening new prisons and overcrowding is no better and the situation is still rubbish" (Participant 2). The new C&AG came with a much more commercial and much less academic background and consequently NAO staff realized that:

> He didn't want a waddle around the issues. He wanted facts, he wanted data, he wanted evidence, he wanted to come up with a conclusion that actually said something meaningful
>
> (Participant 2).

However, over time, the NAO went further and began to combine or generate its own data as well. There are several examples of the NAO doing this: for example, combining data about public spending on flood defenses and the risk of flooding (Participant 26) or using internal government data to aggregate together spending figures for the UK on the COVID-19 pandemic (Participants 7 and 8). This data aggregation role was particularly important in local government, where the UK government

published statistics but did not necessarily draw them together in a comparable way. Participant 3 explained how in their opinion, the NAO was "the only set of people that have a continuous measure for English local authority spending power, because it's not comparable unless you can clean the data up, so we are the standard measure for the sector for that".

The second key development to the NAO's reporting was rather than just publishing this data, even with new comparisons in it, to customize that data for a particular audience–or indeed to allow the audience to customize it for itself. A parliamentary official told us that there was a consistent demand from MPs for breakdowns of spending:

> If you were to do a report on funding on cancer diagnosis and treatment, for example, and you could certainly see an appetite for being able to break that down by types of cancer, by trust, always by constituency
>
> (Participant 10).

This kind of reporting would often not be published but come to the MPs as briefing alongside an NAO report (Participant 10). An NAO staff member remembered requests from MPs to get briefing about the data behind NAO reports, for example on military recruitment, broken down by constituency, ethnicity and unemployment (Participant 15). NAO staff were aware that it was not just MPs who wanted this type of data (Participant 15). Therefore, the NAO began generating data in ways that the citizens themselves could manipulate so they could derive what they wished to from it. For example, in 2020, the NAO created an analytic of journey times in the UK to access public services (NAO 2020). The analytic included both a map and graphs but users were able to generate data about how long it took in each local authority, constituency or other division of the UK to get to a particular public service (like a school or hospital). The data could further be filtered to enable the citizen to discover how long it would take them to access a top-rated public service as well.

The most important barriers to this kind of reporting transforming the nature of the NAO's work were constitutional. Regarding audit, ultimately, the NAO reports to Parliament either through an audit certificate on the accounts or a report from the C&AG to the House of Commons. The audit certificate has a standard wording and would normally only change if there were concerns about the accounts that had to be noted. Consequently, almost no technological change can be noted in the form of financial audit reporting over the period. The value for money reports are freer in form, though they have to be laid before the House of Commons and they have to sit within the Parliamentary conventions of publication. Auditors were cautious regarding even value for money reports though. They acknowledged that the publication of data could be controversial. Participant 26 thought that the NAO's role was not primarily to provide transparency itself but to suggest that government should do it itself:

> Is that our job to be putting information out into a public domain? In some cases, I think our role should be to say that the government department is not doing it and should be doing it.

This caution had consequences. In the case of the COVID-19 cost data, the NAO acknowledged that, in publishing data about the costs of the pandemic, they were going beyond their traditional role: the auditors decided, after discussions at senior levels to go for the "maximum safest" disclosure whilst trying to preserve the auditor's and the data's objectivity (Participant 8). This caution reflects the NAO's view that reporting had to fit into established patterns of auditor conduct.

The last barrier consists of Parliament itself and its appetite for digital information. Participant 10 suggested to us that the Parliamentary committees were often "quite old school" in the way that they used information and that if MPs were allowed data they could customize, "you would need to have more skilled parliamentarians or parliamentary researchers" to maximize the benefits of it. Furthermore, to make use of Parliamentary privilege, the House of Commons authorities demand that anyone (including the NAO) laying papers before the Commons needs to send them as a PDF document: this limits the functionality of how the NAO can report (UK Parliament 2024).

5 | Discussion and Conclusion

The revolution of digitalization has potential impacts at all sorts of levels. Commentators have forecast that government, democracy, and private industry will all be revolutionized by digital technologies (Dunleavy et al. 2006; Dunleavy and Margetts 2013, 2023; Margetts and John 2024).

SAIs are ripe for digitalization as they are not impeded by the fact that they offer personal services (Baumol 2012). They also sit at a key point inside the public sector, spreading good management practice through the sector and themselves being a key part of the accountability and governance structure for the sector (Gendron et al. 2001; Ferry and Midgley 2022; Midgley et al. 2024).

So far, reports of digitalization inside SAIs have noted opposition and provided evidence of a slow, evolutionary pace of change (Otia and Bracci 2022; Ferry and Midgley 2023; Volodina and Grossi 2024), which this paper sought to understand by breaking down that large overall research question (why despite the promises of digitalization, little change had been achieved) into 3 lines of enquiry about the themes of the regulatory space of SAI audit identified by Ferry, Hamid, et al. (2023); mandates, capacity, and reporting. This paper has sought to understand how and whether this is happening by looking at the case of an SAI, the UK NAO. The NAO was chosen as an SAI to study because it has been seen as a digital innovator among SAIs (Otia and Bracci 2022; Ferry and Midgley 2023).

Our main findings therefore can be brigaded by those discrete 3 lines of enquiry. With regard to the mandate, the paper argues, in line with the literature, that the pressure to digitalize emerged from the NAO's environment. It sought to be the "best in Whitehall" and was under pressure from private sector firms and members of Parliament to digitalize. However, there were significant factors which held the NAO back: Its work is set out by statute and consequently it cannot easily change what it does,

furthermore some of those who could determine its mandate, for example, the regulators of financial audit were opposed to some kinds of digitalization (such as Artificial Intelligence). In terms of capacity, again the paper suggests that the NAO is aware of the phenomenal improvements to its capacity to audit that technology can make. It has made improvements, especially around the use of data analytics in financial audit (Ferry and Midgley 2023) and on specific value for money audits where process mapping and other technical tools have been used. However, as other studies have found, the culture of SAIs changes slowly, partly because the staff change slowly, and it is hard to recruit a new digitally willing and able mix of staff at pace (Ferry and Midgley 2023; Midgley et al. 2024; Volodina and Grossi 2024). Secondly, there are issues about how far senior staff really understand the technology that they have commissioned and its possibilities: This may be one reason that Otia and Bracci (2022) found a deficit in SAI's strategies for digitalization in their work. Lastly, when it comes to reporting, again the paper suggests that there is an appetite for change in the way that the NAO reports to Parliament, especially with regard to value for money reporting, allowing both more customisation and more depth in the audit report. However, both its audience in Parliament and the rigidity of rules about how it reports hold it back.

Taken together, these individual findings to the lines of enquiry allow us to suggest an answer to the overall research question of why, despite its promise, digitalization has not revolutionized the regulatory space of public sector audit. Firstly, in all three areas, the NAO has been keen to view its audit digitally: It sees its mandate threatened by the need to digitalize, it sees the potential gain to capability, and it can understand why and how reporting should change. What is remarkable is how consistent the aspirations of the NAO are with the literature that is cited above. Secondly, the NAO is dependent on relationships with other parts of the public sector: this is true in terms of its capability, where a good set of data analytics might be held back by the inability of public sector entities to provide clean data or in terms of its reporting, with MPs unable or unwilling to make full use of technology. Lastly, the NAO is also dependent on its own wider capacity and capability: It has neither an infinite budget nor an infinite ability to change given the makeup of its staff. Revealing this picture in a SAI, especially an advanced one, indicates that digital change is not impossible, but hard.

As a theoretical contribution, therefore, this paper emphasizes that to understand the process of digital change, scholars need to see it in the context of regulatory space. The utility of regulatory space to the study of digitalization is that it incorporates both the organizational perspective and the organization's setting within a network of other bodies that superintend, regulate, control, or contribute to its work. Regulatory space has been used as a tool to understand the extension of audit into new domains or its historical development (Andon et al. 2015; Ferry, Hamid, et al. 2023; Midgley et al. 2024). Regulatory space, by emphasizing and giving visibility to the networks of permission required to allow digitalization to proceed, shows not merely that digitalization is a set of evolutionary rather than revolutionary changes, but also explains why that is so. The SAI, in this case, is not an isolated organization but sits within a network of organizations and even individuals. Change cannot happen overnight.

We offer some thoughts on future research. This study has used an SAI to interrogate the development of digitalization in a public sector auditor. Regulatory space has often been used to map the powers of public sector auditors (including SAIs) (Ferry and Ahrens 2022; Ferry, Hamid, and Hebling Dutra 2023; Ferry, Midgley, Ruggiero et al. 2023). Studies that use regulatory space as a tool to understand the evolution of public sector auditors are less common (Midgley et al. 2024). This study is the first to use this theory to understand the dynamics behind a specific series of changes—digitalization—and this exposes how networked these changes are between the SAI and other organizations.

Empirically, scholars could examine organizations with similarities to the SAI to see how far these findings extend into the management and accountability of the public sector, for example, other SAIs, finance ministries, other ministries and departments, and local governments. Understanding how public sector "back offices" are or are not digitalizing is important as they are the areas where there are fewer public facing jobs which may be harder to digitalize (Baumol 2012). Furthermore, as is suggested here, these organizations may find it easier to digitalize in groups: For example, auditors and finance departments, procurement functions, and central procurement agencies.

For practice, there are implications from this study for the process of digitalization. As Volodina and Grossi (2024) emphasize, organizations need to understand how much change their staff can accept and absorb. Organizations also need to be alert to their co-dependencies with other organizations and their dependency on legislation. For policy makers, this paper suggests that digitalization may proceed in stages: Policy makers need to consider where and what digitalization can or should take place, rather than demanding complete change at once. Furthermore, given the insights both from this study and Otia and Bracci (2022), it is vital that policy makers who want to digitalize their organizations both have a clear understanding of the organization they wish to digitalize and the technology they wish to use.

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Ethics Statement

The authors have nothing to report.

Consent

The authors have nothing to report.

Conflicts of Interest

The authors declare no conflicts of interest.

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Documentation is publicly available, but interview transcripts are not publicly available.

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