

Reviewing the literature on audit teams: moving forward what we know in light of the emergence of new technologies

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Mara Cameran and Angelo Ditillo

Bocconi University, Milan, Italy, and

Angela Kate Pettinicchio

Università Cattolica del Sacro Cuore, Milan, Italy

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Abstract

Purpose – Audit teams are a fascinating area of research, and their relevance has been more and more widely recognised in both theory and practice. The objective of this paper is to analyse the papers that, over the last two decades, have investigated different aspects of audit teams and to draw some conclusions on the state of the art in this field.

Design/methodology/approach – Firstly, we conducted a descriptive analysis of the papers published on the topic and a bibliometric review of the literature using social network analysis (SNA). Secondly, we examined the specific contents of all the papers published on audit teams and critically assessed them. We adapted the framework by Georganta *et al.* (2024) and classified contributions in relation to dimensions that affect audit teams' outcomes. We then considered the impact that the evolution of technology has on audit teams. To do this, we relied on the existing evidence from studies that analysed the impact of new technology on audit activities. Finally, we summarised our conclusions, highlighting the avenues for future research, as well as policy implications. The authors declare that AI tools were used solely for checking the syntax and grammar of the text, with the aim of improving correctness and clarity.

Findings – Our analysis shows some fragmentation in the literature due to the rather limited focus on audit teams as the main unit of analysis. In addition, it reveals the potential characteristics of an “ideal” audit team and the profiles of its members, a number of features within the audit procedures that are beneficial to audit outcomes, and the impact of softer dimensions on the outcomes of the auditing process. It also reconsiders the conclusions achieved in the past research, in light of the advent of new technologies. Finally, we propose avenues for future research, as well as policy implications.

Originality/value – Audit teams play a pivotal role in determining audit outcomes. This is widely recognised nowadays in both theory and practice and is confirmed by the Public Company Accounting Oversight Board (PCAOB), which highlights that the specifics of audit teams are key to achieving audit quality (PCAOB, 2015). It is therefore crucially important to understand what we know about the characteristics and functioning of auditing teams, as well as their consequences. So far, no attempt has been made to systematically review the literature that explicitly focuses on audit teams. While there are studies that review various dimensions of auditing, such as audit fees and audit partners (Hay *et al.*, 2006; Lennox and Wu, 2018; Simnett and Trotman, 2018), none has considered audit teams as the unit of analysis. Our objective is to fill this void.

Keywords Audit teams, New technologies, Literature review

Paper type Literature review

1. Introduction

Audit teams play a pivotal role in determining audit outcomes. This is widely recognised nowadays in both theory and practice and is confirmed by the Public Company Accounting Oversight Board (PCAOB), which highlights that the specifics of audit teams are key to achieving audit quality (PCAOB, 2015). It is therefore crucially important to understand what



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we know about the characteristics and functioning of auditing teams, as well as their consequences. So far, researchers have not attempted to systematically review the literature that explicitly focuses on audit teams. While there are studies that review various dimensions of auditing, such as audit fees and audit partners (Hay *et al.*, 2006; Lennox and Wu, 2018; Simnett and Trotman, 2018), none has considered audit teams as the unit of analysis. Our objective is to fill this void. We analyse and critically assess the papers that have investigated different aspects of audit teams over the last two decades and draw conclusions on the state of the art in this field. We also take the analysis further and reconsider the conclusions reported in the literature, in light of the emergence of new technologies [1]. We consider this a necessary step, given the revolution that these new technologies are bringing in the auditing realm. We believe that neglecting these changes would make our analysis only tentative and incomplete.

To these ends, first, we conducted a descriptive analysis of the papers published on the topic and a bibliometric review of the literature using social network analysis (SNA). Second, we examined the specific contents of all the papers published on audit teams and critically assessed them. We adapted the framework by Georganta *et al.* (2024) and classified contributions in relation to dimensions that affect audit teams' outcomes: specifically, inputs, audit procedures, team processes and emergent states. Inputs refer to individual-level (attributes of team members) and team-level (the combination of such attributes or team characteristics) dimensions that play a role in the functioning of audit teams. Audit procedures are related to audit activities that require the combination of multiple members within the team. The last dimension refers to team processes and emergent states, which concern action processes and affective states of individuals. We then considered the impact that the evolution of technology has on audit teams. To do this, we relied on the existing evidence from studies that analysed the impact of new technology on audit activities. Finally, we summarised our conclusions, highlighting the avenues for future research, as well as policy implications.

Our descriptive and social network analyses showed that, despite the growing interest in audit teams over time, the literature focused on audit teams is scarce and fragmented. In addition, it has, so far, only marginally dealt with the role of technology in the functioning of audit teams. Papers focusing on audit teams tend to concentrate only on a subset of papers on the topic, revealing some "tribalism" in the literature in this field, and papers focusing on technology and audit teams are characterised by a low level of centrality.

Our analysis of each paper's contents helped to identify some potential characteristics of an "ideal" audit team and the profiles of its members, as well as features of the audit procedures that are beneficial to audit outcomes, reflecting on the impact of softer dimensions (such as emotions and cognition, information sharing, group affiliation and cohesion, culture and leadership) on the outcomes of the auditing process. It also allowed us to discuss the impact of new technologies on the audit teams' structures, the integration of new competencies in the audit team, the selection of its members and the soft dimensions of audit team dynamics (Alles, 2015; Afsay *et al.*, 2023).

The analysis of the content of the papers also allowed us to reveal the wider effects that new technologies can have on the work of audit teams. In particular, we discuss the way in which audit teams bring in the specific competencies needed for the use of new technologies, impacting the communication and stability of audit teams. We also discuss how new technologies will affect the traditional cost-quality trade-off, as well as the level of conflict between the members of the audit team, the design of management control systems and leadership style.

Finally, the last step of our analysis focused on recognizing the mediating role that the structure and functioning of audit teams have in explaining the relationship between the introduction of new technologies and audit outcomes, and other aspects that have been neglected in the literature and that open new avenues for future research. Important areas that should be carefully investigated, emerging from the adoption of new technologies, are related, for example, to the transition process necessary to implement new technologies, the potential changes in the power dynamics of the auditing teams, and the behavioural and motivational

reactions of individuals to emerging innovations. We conclude by highlighting potential policy implications, in terms of the use of new sources of data, the structure and composition of audit teams, and remote working practices. This will help to make new technologies more effective. At the same time, while technology is quickly transforming audit work, audit professionals, academics, policy makers and regulators are lagging behind. Notwithstanding the progress made by the International Ethics Standards Board for Accountants (IESBA), which revised its Code of Ethics in 2023 to address ethical and independence challenges arising from the use of new technologies (effective from December 15, 2024), the International Auditing and Assurance Standards Board (IAASB) is still in the process of integrating technological developments into its auditing standards. Meanwhile, although regulators worldwide are becoming increasingly attentive to the implications of technology and remote work for audit quality, none have proposed criteria regarding the structure or composition of audit teams, required their mandatory disclosure, or established minimum presence requirements for teams necessary to deal with these new technologies. To embrace the technological transformation, we need a more active engagement from these subjects to fully exploit the potential advantages deriving from this revolution.

Our study contributes to the auditing literature by providing a specific focus on auditing teams and by highlighting the specific features an auditing team should have to work effectively. Also, we contribute to the literature by reflecting on how emerging technologies may give rise to new complexities in team development, leadership, supervision and power dynamics.

Still, we also provide practical and policy-relevant implications for audit firms, standard setters and regulators. In particular, we highlight how technological change may affect team composition and structure and may influence the effectiveness of certain audit procedures. Our findings suggest that regulatory frameworks and audit standards must evolve in tandem with technological adoption to ensure audit quality and relevance.

2. Method and scope of the review

In order to conduct our systematic literature review, we used the PRISMA_P (Preferred Reporting Items for Systematic review and Meta-Analysis Protocols) 2015 checklist [2], as suggested by Hardies *et al.* (2024). Our review included papers published in English during the last 24 years (in the period 1999–2023) [3] in the following 10 journals [4]: *Accounting, Organisations and Society* (AOS); *Auditing: A Journal of Practice and Theory* (AJPT); *Behavioural Research in Accounting* (BRIA); *Contemporary Accounting Research* (CAR); *European Accounting Review* (EAR); *Journal of Accounting and Public Policy* (JAPP); *Journal of Accounting and Economics* (JAE); *Journal of Accounting Research* (JAR); *Review of Accounting Studies* (RAST); and *The Accounting Review* (TAR). These journals are generally recognised as leading accounting and auditing journals, based on citations and impact. These are the same publication outlets as those used by Simnett and Trotman (2018) in their review of experimental auditing research [5]. In pursuit of completeness, we also searched for papers dealing with our topic of interest (by using the keywords presented below) published in journals whose titles include one of the following keywords: Manag*, Human* and Organisation*.

To this end, we used the Business Source Ultimate database to extract only articles published in the abovementioned journals [6]. Business Source Ultimate, specialized in business, management, finance and economics, allows us to filter for journals, and it provides access to the full text of these articles. In particular, by using Business Source Ultimate, we identified papers by selecting the above-mentioned cluster of publication outlets and searching for audit* and team* or group* in the title of the published papers. We then repeated the search for the same publication outlets by searching for audit* and individual* or partner* in the title of the published papers and team* or group* in the abstract. Finally, for the aforementioned publications, we searched for audit* in the title of the published papers, and team* or group* in

the abstract. By doing so, we initially identified 128 papers that met these criteria. We developed this search strategy in a sequence of rounds (Hardies *et al.*, 2024), in which we finalised the criteria for identifying relevant contributions by analysing the contents of the papers and their references. Based on these strategies, we identified 79 studies relevant for our review (see Table 1 and Table A1 in Appendix 1).

3. Descriptive and social network analyses of the literature: “how” and “what”

Once we had selected the studies relevant for our analysis, we extracted and summarised all of the necessary information to conduct our descriptive and social network analyses in a structured way. We initially described the selected papers on the basis of their general characteristics (year, journal, method and topic) to identify the macro trends in the field. Figure 1 shows the number of papers published annually. There has been a constant interest in this topic, with a peak in 2015 and an increasing trend over the last few years (47 of the 79 papers included in the sample were published in the last nine years).

Figure 2 shows the distribution of papers by journal, indicating an interest in this topic in all major accounting journals, with a more pronounced consideration in *AJPT* and *TAR*.

Regarding the methods adopted to study audit teams, Figure 3 shows that the most frequent method of investigation was through experiments (35 papers). This can be explained in two different ways: on the one hand, the functioning of audit teams depends on the various psychological characteristics of members, and these characteristics can be effectively studied

Table 1. Papers selection process

Selection process	Number of papers
Number of papers identified by keywords	128
Excluded non-relevant papers (not related to audit teams despite meeting search criteria)	49
Number of papers included in the review	79
Note(s): Table 1 presents the selection process used to identify the papers relevant for our literature review	
Source(s): Authors’ own work	

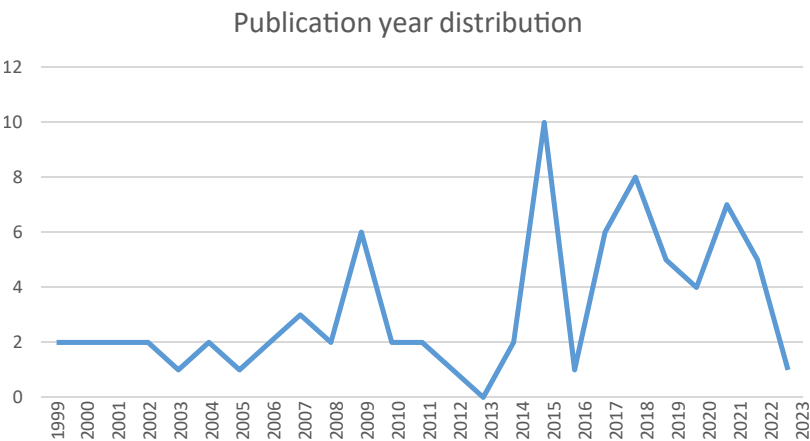


Figure 1. Distribution of papers by year. Note: Figure 1 presents the distribution of the papers included in the review by year of publication. Source: Authors’ own work

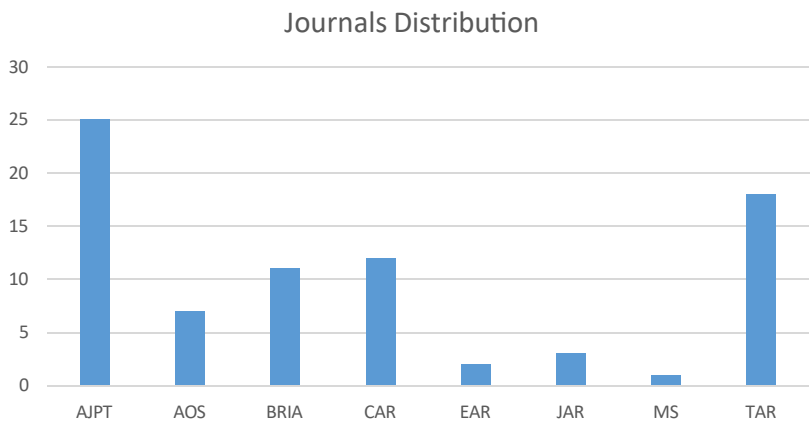


Figure 2. Distribution of papers by journal. Note: [Figure 2](#) presents the distribution of the papers included in the review by journal. Source: Authors' own work

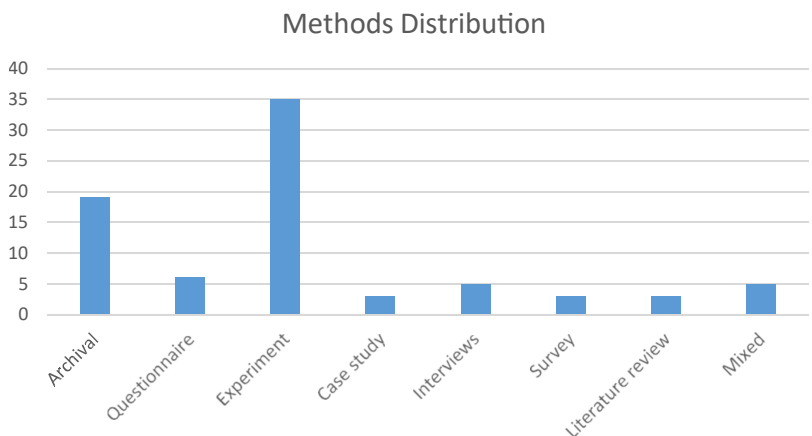


Figure 3. Distribution of papers by research method. Note: [Figure 3](#) presents the distribution of the papers included in the review by research method used in the specific study. Source: Authors' own work

in laboratories; on the other hand, the difficulty in accessing data on this topic makes the study of the dynamics of audit teams more difficult when applying other methods.

With reference to the content of the papers investigated, [Figure 4](#) highlights the focus of the papers included in our analysis. We read, analysed and clustered papers for similarity. While originally, each co-author individually defined the categories, we used a consensus approach to finalise the definitive list of topics analysed in the papers. The data suggest that there is a prevalence of papers concentrating on team processes and emergent states in audit teams, whereas other topics seem to be almost equally represented in the literature. It is interesting to note that out of the 79 papers analysed, only seven focused on the impact of technologies.

Second, we analysed the literature using SNA to identify the citation patterns characterising the papers on audit teams under consideration in general and those that incorporate the role of technologies in their analysis ([Scott, 2000](#)). To this end, we used UCINET 6.688 as the

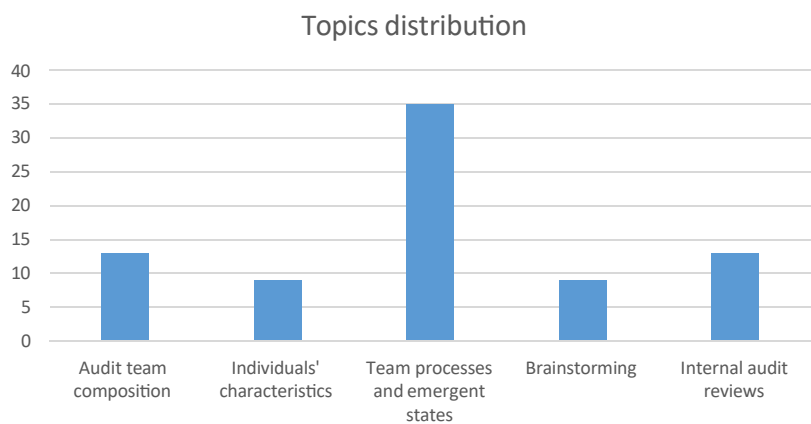


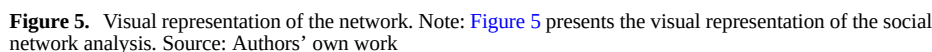
Figure 4. Distribution of papers by topic. Note: [Figure 4](#) presents the distribution of the papers included in the review by topic. Source: Authors' own work

statistical software to investigate the patterns of relationships between the papers, and NetDraw as a visualisation tool, to represent some results ([Borgatti et al., 2002](#)). To conduct our analysis, the papers represented the nodes of the network and the citations between papers represented the ties between the nodes as the basis for calculating the main properties of the network [7]: centrality [8] and density [9]. In fact, while papers seek to progress the understanding of certain phenomena, they do so by building on previous achievements and conclusions, and by citing previous papers. Therefore, the strength of a paper can be seen as contingent on its role in generating further literature and is measured by the number of times it has been cited [10]. To this end, the papers that are cited more often are usually those with the highest in-degree centrality: [Agoglia et al. \(2003\)](#) - n-InDegree: 0.190; [Tan and Jamal \(2006\)](#) - n-InDegree: 0.165; [Dowling \(2009\)](#) - n-InDegree: 0.139; [Russo et al. \(2000\)](#) - n-InDegree: 0.139; [Boritz et al. \(2015\)](#) - n-InDegree: 0.127. To see a graphical representation of the network of citations (where the nodes represent the papers and the ties are the citations) see [Figure 5](#).

It is interesting to note that none of these studies considered the impact of technologies on the auditing process. In addition, if we consider the whole level of citations to be measured by the number of actual citations (active ties) over the number of all potential citations that could have occurred among the papers considered (total potential ties), we can see that it is rather low.

$$Density = \frac{Active\ Ties}{Total\ Potential\ Ties} = \frac{225}{3081} = 7.30\%$$

This indicates that, in general, the articles in the sample tend to focus on a sub-sample of papers, characterised by more proximity, thus showing some fragmentation in the literature. We can explain this phenomenon in several ways. Firstly, given the interdisciplinary nature of studies on teams and the variety of perspectives to study them, in many cases authors refer to other papers that study teams, in general, outside the field of accounting, rather than audit teams specifically. Secondly, given the extension of our time horizon and the progress made in the field in recent years, it is possible that papers tend to refer to more recent papers that build on previous research and findings, without necessarily citing older ones. For example, [Dennis and Johnstone \(2018\)](#) only cite eight articles in their network of papers, seven of which refer to



4. Reviewing the contents of the audit team literature: achievements and challenges

4.1 Audit teams' inputs

4.1.1 Papers on audit team composition. The literature has examined audit team composition and analysed its impact on team performance and audit pricing. With reference to the relationship between team composition and team performance, different studies have focused on specific levels of audit teams. The number of *senior* auditors in the audit team has been found to be positively associated with audit quality (Hossain *et al.*, 2017). Also, the proportion of leading auditors sharing a *common educational background*, as well as the proportion of *female* leading auditors, positively relates to audit quality and efficiency (Cameran *et al.*, 2018). Also, the diversity of the signing auditors (measured by demographics, education and skills) is positively associated with audit quality, in line with the idea that diversity facilitates team performance (He *et al.*, 2021). Examining *audit staff*, Knechel and Payne (2001) reported a negative relationship between the use of *more experienced* audit staff and audit report lag, with the latter being associated with higher audit efficiency. Taking a broader view of *external professionals* involved in the work carried out by audit teams, the

literature has also documented that the contribution of *offshore auditors* influences audit team performance. Downey's (2018) results revealed that, when participants complete work from a point in progress and when they perceive the task as less significant, which are typical characteristics of offshore work, the performance is poorer. Other contributions have focused specifically on *industry knowledge* and *specialists* and highlighted their impact on audit team performance. With reference to *industry knowledge*, engagement partner's co-signing relationships with non-engagement industry specialist partners facilitate knowledge sharing and, hence, improve audit quality (Huang *et al.*, 2022). Moreover, the extent and distribution of industry knowledge within a team affects audit hours and audit quality; specifically, industry knowledge has a positive impact on audit quality when it is spread throughout the team (Cahan *et al.*, 2022). With reference to *specialists*, consultation with forensic specialists positively affects performance (Asare and Wright, 2018). Additionally, there is evidence that when tax specialists are involved in audit tasks, they make similar judgements to auditors (Bobek *et al.*, 2021). However, other studies highlighted how involving specialists has some side effects (Jenkins *et al.*, 2018; Boritz *et al.*, 2015). Indeed, relying on specialists increases auditors' sense of comfort but, at the same time, it may imply a client's discomfort, given that its personnel needs to spend time and effort dealing with them. Considering different types of specialists (tax, IT, valuation, forensic), Boritz *et al.* (2020) documented that the integration of the work of specialists with the work of auditors is a challenge for both groups. According to auditors, specialists can cause budget overruns, delays and harm to client relationships. At the same time, specialists fear that limiting their involvement in the audit process might have negative effects on audit quality.

Finally, other studies have examined the specific impact of audit team composition on audit pricing. The number of auditors is positively associated with audit fees. However, given that a higher number of assistant auditors and other professional staff [11] is not necessarily associated with audit quality, larger teams do not always imply better performance (Hossain *et al.*, 2017). At the same time, Behn *et al.* (1999) documented a positive relationship between audit fees and client satisfaction with the audit team.

Overall, from the review of literature reported above, we can derive the potential principles on how to compose the "ideal" audit team. The latter would benefit from the involvement of more seniors, more women, members with a common educational background, experienced staff, specialists when needed and a limited number of offshore professionals. It is interesting to note that a team with a high number of professionals, while associated with higher client costs, does not necessarily imply a better audit outcome. However, the above contributions do not always consider the cost side of these choices, thus neglecting the cost-quality conflict, and it is not obvious that the same effects would be achieved if all these team characteristics were combined in practice.

Would these conclusions be confirmed by the changes expected from the adoption of new technologies in the audit domain? To answer this question, we first reflect on how new technologies may transform audit teams. With the advent of new technologies, specific technical competencies are required (Liu *et al.*, 2019). Senior auditors may not be equipped with technical knowledge, while new generations may be more prone to acquiring this expertise, which will make staff training and expertise development for novices more crucial (Omoteso, 2012). Therefore, we cannot easily assess the optimal balance between senior and junior auditors inside audit teams, with a specific reference to audit outputs. In addition, more women in the team should be reconciled with the well-documented gender gap in the areas of science, technology, engineering and mathematics (STEM). The common educational background of the team may not be a desirable characteristic of team composition, given the need to integrate teams with different technical competences. Moreover, the relevance of having an IT specialist, highlighted in previous literature, is likely to become even more important (Alles, 2015). This would particularly be the case for teams where engagement partners and senior auditors are less familiar with new technologies, allowing them to obtain a sufficient sense of comfort within the new audit environment. Furthermore, the space available

for offshore professionals may be lower or higher. On the one hand, this space could be reduced because new technologies, especially those related to data mining and data analytics, could improve the efficiency of some audit tasks (Baldwin *et al.*, 2007; Fedyk *et al.*, 2022) and, in general, financial statement audits (Cao *et al.*, 2015; Gambetta *et al.*, 2016). On the other hand, space could be increased to manage the inefficiencies potentially derived from the adoption of new technologies, if not well supported and managed (No *et al.*, 2019). Finally, the increasing importance of new technologies might soften the documented relationship between the number of auditors involved in a job and audit fees, as new technologies in audit jobs could improve the effectiveness and efficiency of an audit. However, as already noted, new technologies might even create inefficiencies if they are not well implemented and managed and, consequently, the number of professionals involved in an audit engagement might be expected to increase.

4.1.2 Papers on individuals' characteristics. The literature on audit teams commonly considers the characteristics of individual members as of utmost importance in explaining audit outcomes (Gul *et al.*, 2013; Nelson and Tan, 2005) and can, therefore, affect the functioning of audit teams. Different studies have primarily focused on *partners* and their impact on audit outcomes; this is due to recently increased data availability [12]. Audit partner quality is crucial for engagement quality (Wang *et al.*, 2015; Chen *et al.*, 2020) and audit partners' past performance predicts their future performance (Wang *et al.*, 2015). Relatedly, Chen *et al.* (2020) reported that the audit partner's style effect is stronger for larger audit firms. With reference to the characteristics of specific partners, Che *et al.* (2018) relate both the level of a partner's formal education and professional experience to audit quality. Also, the general knowledge of clients that the partner has is an important aspect. Audit performance is higher when audit partners communicate with the clients' tax partners (De Simone *et al.*, 2015). Finally, client-specific experiences have been positively associated with audit quality (Contessotto *et al.*, 2019).

Other researchers have looked at different team members and concentrated on various aspects that may contribute to team performance. With reference to *managers*, manager's client-specific experience is relevant for audit quality (Contessotto *et al.*, 2019). In relation to *junior staff*, Yen (2012) documented that more staff-level auditors could be a viable alternative to more experienced auditors for certain analytical review procedures. Concerning *specialists*, the literature indicates that industry specialists are generally more confident than non-specialists, in their assessments and that their impact on audit outcomes depends on the class of transactions examined (Taylor, 2000) and on the stage of the decision-making process (Moroney, 2007). Finally, Maso *et al.* (2020) highlighted that overall team performance may benefit from knowledge "spillover" from clients' corporate social responsibility (CSR) assurance teams.

Overall, the previous literature suggests that teams would benefit from being led by partners of higher quality, with a record of good past performance, professional experience and general knowledge, as well as experience of the client. Audit teams should also take advantage of managers characterised by exposure to clients and specialists for certain types of transactions and decisions. Would these findings be challenged by the advent of new technologies? While we can take for granted that the profiles of audit teams' members have to change to incorporate new technical competences, it is more problematic to understand how to integrate them with skills related to critical thinking, professional judgment and scepticism (Boland *et al.*, 2019; Jemine *et al.*, 2024). We should also consider skills concerned with how to "appropriately manage potential ethical compromises that may result from decision making by an algorithm" (ACCA, 2019, p. 7). At the same time, cognitive technologies and data analytics could help young auditors to move to the most interesting parts of auditing and effectively and efficiently perform the more mundane aspects of the work (ACCA, 2018). Consequently, it may become difficult to maintain the expertise that would have been acquired with more repetitive tasks, thus potentially inhibiting novices' knowledge base and the development of professional judgement skills (Omoteso, 2012). These aspects also affect the

selection process, which has to identify candidates not only with traditional audit competencies but also with positive behavioural orientation toward new technologies (Abou-El-Sood *et al.*, 2015). In addition, other aspects should be considered for the expertise of the teams; for example, the knowledge of the clients acquired through experience over time could be replaced by the availability of Big Data regarding clients and their related analyses (Alles, 2015). At the same time, new IT specialists should be involved in managing potential side effects derived from the use of new technologies, such as information overload and ambiguity (Brown-Liburd and Vasarhelyi, 2015; Brown-Liburd *et al.*, 2015).

4.2 Audit procedures

In relation to audit procedures, the literature has mainly focused on *brainstorming* and *internal audit reviews*. The related papers could only be indirectly related to audit teams, as their main focus was on the characteristics of the audit procedures. However, given that formally these studies meet the search criteria, and that the implementation of these audit procedures requires, by definition, the combination of multiple individuals belonging to a team, we believe that they are nevertheless relevant to our analysis.

4.2.1 Papers on brainstorming. Audit Standard SAS 99 requires brainstorming sessions to help auditors detect fraud. It is unclear whether brainstorming can always be considered an effective tool. Prior literature highlights some potential fraud-detection risks derived from requiring auditors to attend brainstorming sessions. Diehl and Stroebe (1987), for example, identified production blocking and social loafing as possible threats associated with brainstorming sessions. Gissel and Johnstone (2017) found that psychological safety and auditor knowledge influence a subordinate's willingness to share privately known, fraud-relevant information, thus affecting the effectiveness of brainstorming sessions.

Another risk of brainstorming is represented by younger team members who decide not to participate in discussions to avoid evaluation by senior members (Trotman *et al.*, 2015). Carpenter (2007) found that brainstorming sessions lead to fewer ideas, but ones of a higher quality, compared to ideas generated by individual auditors (defined as the "nominal groups"). Hoffman and Zimbelman (2009) compared the benefits of brainstorming sessions with those of strategic reasoning. The authors found that both brainstorming and strategic reasoning help auditors generate quality ideas to reduce the risk of fraud, but a combination of these interventions (for example, requiring auditors to individually answer the above questions before brainstorming) is not significantly more effective than either intervention when used alone.

Auditing standards do not provide specific instructions on how to implement brainstorming team sessions. The auditing literature has, therefore, sought to understand what could be the best means to increase brainstorming effectiveness and reduce the risks of brainstorming sessions, as outlined above (production blocking, social loafing and evaluation apprehension). Specifically, the literature has focused on *face-to-face communication* versus *electronic, structured* versus *unstructured* or *nominal* versus *interactive*. Trotman *et al.* (2015) summarised recent findings on different brainstorming mechanisms. The literature seems to agree that *face-to-face brainstorming* is more effective when specific guidelines (e.g. sequential unpacking [13] or pre-mortem [14] instructions) are provided (Chen *et al.*, 2015b; Trotman *et al.*, 2009). Nevertheless, *unstructured* brainstorming sessions (where the discussion is therefore left "open" and no instructions are provided) are the commonly used brainstorming techniques in practice (Trotman *et al.*, 2015). The literature has also focused on *electronic* brainstorming, which uses technology to allow group members to individually input ideas without interruption, thereby reducing production blocking and decreasing evaluation apprehension. While earlier literature reported that *interactive* brainstorming (Osborn, 1957) was more effective in stimulating creative discussions, nominal brainstorming has some benefits, as it decreases production blockage and evaluation embarrassment. Chen *et al.* (2015a) found that *nominal teams* generate a significantly larger number of unique fraud risk

factors and fraud hypotheses than interacting teams. Nominal teams also generate high-quality fraud hypotheses.

Recently, the literature has also highlighted that group composition might affect brainstorming effectiveness. [McAllister et al. \(2021\)](#) find that groups with a minority (but not a majority) of auditors characterised by high traits of scepticism develop more fraud ideas and assess higher fraud risk than control groups with no highly sceptical traits.

As a whole, the literature seems to suggest that brainstorming sessions with specific predefined guidelines, which are electronically conducted, nominal and where a minority of members are high-trait sceptics, contribute to reducing the risks and increasing the effectiveness of these tools. However, some uncertainty in these conclusions may be derived from the interaction of these elements in practice, whose effects have not been investigated, in terms of their complexity.

How will new technologies affect brainstorming activities? While the expectation is that brainstorming sessions will gradually leverage electronic tools, the consequences of this trend are characterised by some uncertainty. On the one hand, the increased use of new communication technologies might be beneficial for fraud detection (and ultimately audit quality), as this might limit the potential threats derived from face-to-face meetings, such as production blockage, social loafing and evaluation embarrassment. On the other hand, it is also possible that the sophistication of communication technology tools, which make the remote experience more similar to the in-person one, will reintroduce the same problems of face-to-face meetings, thus removing the filtered way of interaction activated by technology ([Bauer et al., 2022](#)). Additionally, new issues may emerge when organising brainstorming sessions. As data analytics allows for potentially reviewing 100% of the population, more brainstorming sessions, with some specifically dedicated to data mining, may be necessary ([No et al., 2019](#); [Tang and Karim, 2019](#)). One should also consider that the potential overload of information generated by Big Data might also lead to the dispersion of ideas and a general decrease in the effectiveness and efficiency of brainstorming sessions, especially when auditors lack specialised digital competences. Consistent with this view, [No et al. \(2019\)](#) highlighted the risk that new technologies might even create inefficiencies: the ability to analyse the full population of accounting transactions, for example, might give rise to a huge number of outliers that would then be impossible (or too expensive) to handle. Finally, [Rose et al. \(2017\)](#) found that the timing at which auditors choose to analyse evidence from Big Data affects auditors' effectiveness. Specifically, the authors suggest that auditors have difficulty recognising patterns in Big Data visualisations when viewed before traditional audit evidence. Therefore, they recommend that auditors adopt data analytics tools after examining more traditional audit evidence. This will potentially make the planning phase even more significant and critical for the overall success of the audit activity.

4.2.2 Papers on internal audit reviews. One common internal control mechanism applied by audit teams to monitor the quality of the service provided consists of internal audit reviews. There are different types of reviews. [Epps and Messier \(2007\)](#) focused on *concurring partner reviews* and found that this type of review is subject to specific audit firm guidelines which are different across audit firms. However, previous literature typically focuses on the review that the senior member of the audit team conducted on the work carried out by the junior levels. This practice seems to increase audit team effectiveness, especially if pursued by specialised teams ([Owhoso et al., 2002](#)). Although this is common practice among audit firms, the academic literature argues that the effectiveness of this mechanism seems to be potentially hindered by different types of biases that may derive from a plurality of factors, such as the influence of active supervisors' coaching, familiarity with the supervisee, and a focus on specific types of errors (mechanical vs. conceptual).

[Peecher et al. \(2010\)](#) found that, when supervisors have directional goals to reach client-preferred conclusions, the active coaching of subordinates increases the risk of biased judgments. [Tan and Jamal \(2001\)](#) showed that, on average, managers evaluate memos written by outstanding senior colleagues more favourably when they know the identities of the authors

rather than when their identities are not revealed. These findings contradict Favere-Marchesi (2006), who demonstrated that familiarity with the preparers (together with face-to-face post-review discussions) positively influences audit team performance in a review process. The literature has highlighted another type of bias concerning the types of errors detected during the review process. Messier *et al.* (2008) argued that partners exhibit significant overconfidence in their ability to detect errors and are more accurate in predicting managers' (rather than seniors') performance, especially in the ability to detect mechanical (simple) rather than conceptual (complex) errors. Harding and Trotman (1999) found that while senior auditors are, on average, more accurate than staff auditors in identifying conceptual errors, staff auditors are better at identifying mechanical errors. Furthermore, Agoglia *et al.* (2003) suggested that the way auditors prepare justification memos affects their judgement, while a later study by Agoglia *et al.* (2010) posited that this bias can be mitigated if the review team member has task-specific experience.

The audit team literature has also attempted to understand the types of reviews that are most effective within audit teams. It focuses on *face-to-face*, rather than *electronic reviews*. It can be argued that, from one perspective, face-to-face reviews can benefit from para-verbal and non-verbal aspects of communication, but from another perspective, electronic reviews might be more efficient. This is because they allow the reviewer to oversee multiple jobs, concurrently and reduce the time spent travelling between clients. However, the literature confirms the benefits of face-to-face reviews (Agoglia *et al.*, 2009a). Brazel *et al.* (2004) found that preparers who anticipate a face-to-face review produce higher-quality judgments, as they are more concerned with audit effectiveness and feel more accountable, even if this comes at a price, in terms of efficiency. Moreover, Agoglia *et al.* (2009b) found that electronic reviews often result in lower-quality judgments than face-to-face reviews, and Dowling and Leech (2014) found that, while electronic support systems seem to increase real-time interactions among team members, the overall quality of team reviews decreases.

Considering the impact of new technologies, it is important to highlight that data mining and data analytics tools, such as machine learning techniques, advanced automated booking systems and advanced audit testing, will inevitably reduce (or even minimise) the risk of *mechanical errors*, possibly making internal audit reviews at lower levels less relevant (Fotoh and Lorentzon, 2023). At the same time, the ability to detect conceptual errors will become increasingly critical (Alles and Gray, 2016), making it essential to limit potential biases in detecting conceptual errors (Messier *et al.*, 2008). In addition, while new technologies may contribute to reducing mechanical errors, at the same time new sources of bias may emerge, including those incorporated in the development of the algorithms adopted in the auditing process and, in general, overconfidence in the technology itself. Finally, the evolution of technology and familiarity with its use may contribute to eliminating some of the benefits of face-to-face reviews, thus making electronic reviews a preferred solution.

4.3 Audit team processes and affective states

The literature has considered auditing performed by teams as a complex phenomenon, characterised by a technical dimension, which also incorporates organisational and social processes (Pierce and Sweeney, 2006). It involves the exercise of rationality, but it is also affected by cognitive and affective states (Nelson and Tan, 2005). Previously, researchers tried to investigate team processes, underlying the importance of partner intuition and image management (McGarry and Sweeney, 2007), informal communication and socialisation in a corporate culture (Jeppesen, 2007), leadership and evaluation style (Pierce and Sweeney, 2004) and clan controls (Pierce and Sweeney, 2005). In particular, some contributions focused on more specific dimensions and tried to reveal how these organisational and social processes are embedded in, and influence the functioning of, audit teams.

Information processing and *team communication* affect audit teams. Authors stressed the importance of information seeking and effective communication both for decision making and

performance evaluation. Bailey *et al.* (2011) showed that auditors who have a propensity to seek and process information before reaching a judgement generate more and higher-quality hypotheses, and Proell *et al.* (2022) showed that when communication of the audit staff is assertive, their evaluation tends to increase. Focussing more on the methods of communication, Murthy and Kerr (2004) showed that the bulletin board tool outperforms the other methods of sharing information, and Trotman *et al.* (2005) showed that the role-playing intervention method improves the communication with the client and enhances outcomes compared to other methods. Other dimensions seem to play a role in more complex contexts. Bauer *et al.* (2019) showed that in a more articulated team made up of auditors and IT specialists, the interaction between them depends on the level of mutual value and respect, is fostered by a weaker one-team identity (Estep, 2021) and is the result of the perceived normative pressure and self-efficacy affecting an auditor's intention to use IT systems (Dowling, 2009). Downey *et al.* (2020), Sunderland and Trompeter (2017) and Downey and Bedard (2019) showed that the challenges of communication faced by audits in the contexts of greater geographic distribution of teams based out of the same office and of global groups tend to be more severe.

Moreover, audit teams' functioning also depends on aspects related to their *coordination* and *leadership*. Some authors concentrated on how leading auditors are chosen, focussing on the conditions under which a lead audit partner is more likely to be selected (Lee *et al.*, 2019), or those that increase the likelihood of dyad formation at the top level of audit teams (Downar *et al.*, 2021). Some other authors concentrated on specific characteristics and practices of auditors at the top and their effects on the auditing teams. The ethical tone at the top (Pickerd *et al.*, 2015) and the managers' orientation (Agoglia *et al.*, 2015) seem to have an important role in the functioning of the audit team, while the level of interdependence relations and the size of the audit team determine supervisor's practices (Gupta *et al.*, 1999). Han *et al.* (2011) looked at those conditions under which audit managers' (seniors') overconfidence in their audit seniors' (managers') knowledge is greater (lesser), while Dennis and Johnstone (2018) studied those that initiate more change in the mental representations of subordinates, still, knowledge and experience at the top affect the functioning of the audit team. Supervisors can find it difficult to detect distortions in subordinates' decision-making because they cannot completely duplicate their knowledge (Russo *et al.*, 2000); at the same time, technical knowledge of auditing can be created and reinforced in instances of everyday practice (Westermann *et al.*, 2015) and can be affected positively or negatively by experience. For example, the experience with the internal audit group of a previously reviewed client affects audit reviewers' internal audit quality assessments (Bhattacharjee *et al.*, 2017), and the experience of non-failed partners with failed audit partners decreases the non-failed partners' client market shares when they lack a track record to infer their audit quality credentials (Gul *et al.*, 2023). Complementarily, lead auditors may use other audit firms' knowledge and experience to perform some of the audit work (Hux, 2021), and management uses knowledge and experience related to prior period budgets to set new budget targets (Ettredge *et al.*, 2008).

In addition, auditing teams also depend on processes of *perception* and *feedback provision*. Tan and Jamal (2006) showed that accuracy in perceiving what others think of one's technical proficiency is more accurate when the predictor auditors are partners and managers. Others focus more on how and when auditors provide feedback and speak up, as well as their effects. Nelson *et al.* (2016), Nelson and Proell (2018) and Kadous *et al.* (2019) showed that supervisors' concerns, focus and intrinsic goals affect the willingness of auditors to speak up; whereas, Clor-Proell *et al.* (2022) identified a broader set of factors likely to help develop a general theory of audit voice. More generally, the literature has shown that individual-specific feedback and average group outcome feedback are effective in reducing overconfidence (Harding and Trotman, 2009).

Finally, also *cohesion* and *climate* impact auditing teams. On the one hand, by considering various dimensions of cohesion, King (2002) and Christensen *et al.* (2021), respectively, found that group affiliation can help reduce biases and that team staffing continuity can improve audit

quality, efficiency and profitability. On the other hand, the process is also affected. A climate of cooperation affects the smooth conduct of the audit engagement (Guénin-Paracini *et al.*, 2015) and a climate of uncertainty avoidance is positively associated with the extent of auditor-in-charge involvement (Bik and Hooghiemstra, 2017); on the contrary, a climate of power and collectivism is negatively associated with it. Also, cognition and emotions play an important role in the process: fear is a key element in a team's auditing work (Guénin-Paracini *et al.*, 2014) and individual emotions are implicated in error management (Seckler *et al.*, 2017).

Overall, the literature on audit processes and emergent states in audit teams described above suggests that an effective information processing and communication, an interaction between the members of the team characterized by mutual value and respect, the tone at the top and an experienced leadership as well the cohesion and a climate of cooperation in the team all affect positively the auditing work, the level of engagement of individuals and the outcomes generated by the teams. However, we might need to reconsider these conclusions in light of the current trends and could be overturned and questioned by the recent emergence of new technologies because of their transformational impact on the auditing process.

First, in relation to information processing and communication within audit teams, new technologies may affect the validity of modularisation and ongoing communication to achieve coordination, due to the need for more formalised and codified modes of interaction required to manage Big Data. In addition, the complexity of the competencies necessary to manage new technologies and Big Data (Appelbaum *et al.*, 2017) may require the development of a common knowledge and language of communication, positioned in the middle ground between audit and technology (Bauer *et al.*, 2019). Moreover, the volume, variety and sources of Big Data (Brown-Liburd *et al.*, 2015) may challenge existing findings related to the preference of the bulletin board tool for exchanging information (Murthy and Kerr, 2004).

Second, the emergence and adoption of new technologies can transform the role and effective characteristics of team leaders and require a more distributed division of responsibilities, a variable composition of the team, and the introduction of new standards of ethical behaviour that go hand-in-hand with how to use the new technologies effectively (Omoteso *et al.*, 2010). In addition, the need to elevate the role of auditing professionals to strategic partners, as a result of introducing new technologies (Liu *et al.*, 2019), may necessitate rethinking the profile of leaders to incorporate new skills in design, change management and governance. Moreover, the focus and concerns of leaders and their supportive roles may involve their re-conception, stressing the importance of using new complex technologies (Baldwin *et al.*, 2007), integrating traditional audit approaches with those allowed by new technologies (Rose *et al.*, 2017), mitigating new potential inefficiencies derived from new technologies (No *et al.*, 2019) and promoting the availability of additional resources (Dagilienė and Klovienė, 2019), as well as the introduction of new evaluative styles (Curtis and Payne, 2008) in line with the transformation in place.

Third, embedding new technologies in the work of audit teams can affect how auditors perceive the other members of the team and the process of providing feedback, as well as group affiliation and cohesion. Given that the influence of others has been found to be an important element in how auditors decide to familiarise themselves with new technologies (Diaz and Loraas, 2010), group cohesion, which has been seen as a positive factor in reducing biases (King, 2002), can become an obstacle in transforming audit teams, with potential consequences on the intention to adopt new technologies and in perceiving the level of knowledge of technology among auditors.

Fourth, Big Data and communication technologies that affect client data access and modes of access (Vasarhelyi and Romero, 2014) may require different strategies and cultures aimed at securing the capacity to work diligently and effectively with the client. Thus, the importance of appropriately managed relational interaction found to be critical in discovering material misstatements (Guénin-Paracini *et al.*, 2015) and a culture of uncertainty avoidance that was positively associated with auditor-in-charge involvement (Bik and Hooghiemstra,

2017) should be replaced with a culture of uncertainty management, necessary to deal with new technologies and Big Data.

Fifth, group affiliation and continuity, emotions and perceptions are all implicated in the social interaction between the members of the audit team. New technologies can affect the emotions and cognition of individuals in teams. They can introduce new sources of fear related to the potential obstacles of implementing data mining and data analytics technology, such as expectations of decreasing audit efficiency in the short term (Dowling, 2009), information overload, information relevance, issues of pattern recognition and uncertainty in the provenance of audit evidence (Appelbaum, 2016; Brown-Liburd and Vasarhelyi, 2015; Brown-Liburd *et al.*, 2015; Appelbaum *et al.*, 2022). This would transform the fear, which acts as a key positive element in audit teamwork, stimulating vigilance and the need to surpass oneself, mitigating habits and maintaining reputation (Guénin-Paracini *et al.*, 2014), into a dangerous source of destabilisation for the audit team. On the other hand, the potential negative impact of data mining, data analytics and cognitive technologies on critical thinking, professional judgement and scepticism (Boland *et al.*, 2019) can, in turn, negatively affect emotions and cognitions implicated in error identification and management within audit teams, thus reducing the quality of the auditing work (Seckler *et al.*, 2017). In addition, the information overload derived from new sources of data (Brown-Liburd *et al.*, 2015), the need to combine more traditional audit evidence with that emerging from the use of new technologies (Janvrin *et al.*, 2008; Cong *et al.*, 2018; Rose *et al.*, 2017) and the potential risk of managing a large number of outliers incorporated in Big Data (No *et al.*, 2019; Salijeni *et al.*, 2021) can affect the disposition needed for closure in the audit team, thus reducing the time spent on the more deliberative and judgmental tasks within audit teams with potential effects on audit quality.

Overall, all the conclusions reported in this section can be summarized and visualized at a glance in Figure 6. Each of the dimensions illustrated, individually or jointly taken, affects the different intermediate and final outcomes of the audit teams.

5. Discussion and conclusions

In this study, we analysed 79 papers that included keywords relating to auditing teams in the title and/or abstract of 10 accounting journals (with the exception of one paper found in a management journal), from 1999 to 2023.

The first part of our analysis categorised the papers according to their various characteristics over time. The second part adopted social network analysis to illustrate the central papers and the level of connection among papers in this field. The third part focused on the specific contents of the papers and classified them according to audit teams' inputs, audit procedures and audit teams' processes and affective states.

Overall, our analysis revealed a growing interest in audit team topics over time, given that almost 60% of the papers investigated were published in the last nine years of the period considered. However, the literature in this field seems to be fragmented, as proved by some of the elements emerging from a deeper examination of the papers. Firstly, there was a prevalence of experimental evidence that would need to be confirmed by other sources of data, collected by alternative research methods, to consolidate the findings (e.g. case studies, interviews and archives). Secondly, the SNA revealed that the papers investigated were characterised by a low level of interconnections, in terms of citations, thus indicating that it is not possible to identify a clear and substantial community of researchers in this field, which could have prevented the development of a critical mass of research on this topic. A potential explanation, derived from a deeper analysis of the contents of the papers, is that, while the papers analysed refer to audit teams, only a limited number of them focus on audit teams as the main unit of analysis. This aspect could explain why the literature has so far neglected key topics concerning the functioning of audit teams. For example, one of these topics relates to the stability of teams, given that their analysis has mainly been conducted by assuming that audit teams, once

formed, remain stable and constant during an engagement. Researchers have not attempted to investigate whether the structure of the audit team and the manner in which it functions changes, or should change, over time to guarantee better audit outcomes. Another neglected topic relates to the fact that researchers have not explored how audit teams interact, the effect of belonging to multiple audit teams simultaneously, or how accumulated knowledge is stored and transferred between teams. Another key aspect that emerged from our analysis is that the advent of new technologies has only marginally attracted the attention of researchers. SNA analysis confirms this by highlighting that, while the level of cross-referencing in the

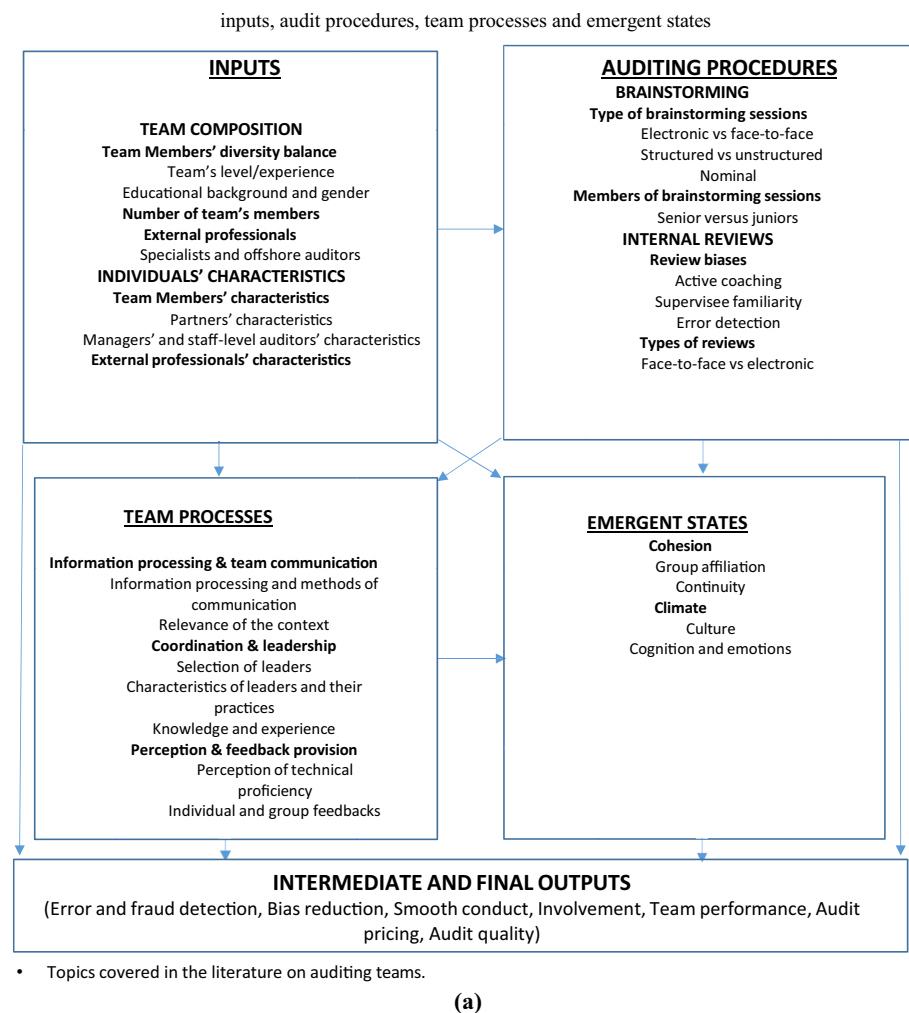


Figure 6. Contents of the contributions on audit teams and related impact of new technologies. Note: This figure presents a summary of our review of the literature, based on the framework adapted from [Georganta et al., 2024](#)). (a) Presents the main contents covered by contributions on audit teams, differentiating by inputs, audit procedures, team processes and emergent states. (b) Potential impacts of new technologies are added in red. Source: Authors' own work



(b)

Figure 6. (continued)

community of contributors studying audit teams is low, the reference to papers incorporating the role of technologies in the analysis is even lower, considering that none of these papers is characterised by a high centrality. This is particularly problematic, in light of the technological changes that are currently occurring, because it means that the studies do not address understanding how audit teams work, considering the support role of technology. In the previous section, we have deeply discussed the implications with reference to the conclusions achieved in the literature. However, there are even wider effects that must be considered with regard to how new technologies can affect the work of audit teams.

In relation to the audit team structure, the use of new technologies requires specific competences to manage different types of technologies such as data mining, data analytics, cloud technologies and, more recently, cognitive technologies; therefore, teams related to audit

engagements are expected to be more diverse, from the point of view of educational backgrounds, as reported in [Section 4.1](#). However, audit teams can reach this diversity either by combining team members with different educational backgrounds or by requiring a more differentiated array of competences for any team member. Both approaches might have important consequences for audit-team dynamics, especially interpersonal communication. In the first case, audit team members with different educational backgrounds could operate less efficiently because communications and interpretations are more complicated, and auditors may make less effective decisions because of a higher risk of misunderstanding. However, in this case, audit teams could also leverage a higher assorted stock of capabilities ([Hoffman et al., 1962](#); [Wanous and Youtz, 1986](#)), exploiting the potential to shake up existing codes and categories and thus identifying new solutions that contribute to improving team performance ([De Vaan et al., 2015](#)). With the second approach (i.e. comprising teams with members characterised by a more differentiated array of competences), the process of evaluating, communicating with and even predicting the behaviour of others may be facilitated thanks to a similarity of attributes and experiences or cognitive similarity related to a common culture and related interests ([Kossinets and Watts, 2009](#)).

These choices are key because they may also impact audit teams' stability. Forming teams with auditors of quite different specialist backgrounds may enable them to cope with the needs of the major part of the clients; therefore, it is not necessary to incorporate new members with specific expertise over time. Alternatively, composing teams of auditors with an array of differentiated competences also means that the competences needed for "a standard" engagement are present in each member of the team.

Regarding the impact of new technologies on audit procedures, it is difficult to predict whether they will have positive or negative impacts, especially if we consider the traditional cost-quality conflict that characterises the audit environment ([Pierce and Sweeney, 2004](#)) [15]. On the one hand, data mining and analytics tools as well as cognitive technologies will allow auditors to collect more evidence from different sources that go beyond traditional documents. This may undoubtedly allow auditors to increase quality by detecting errors and fraud, while simultaneously reducing time pressures and the relative behavioural distortions highlighted in the literature. However, auditors must deal with an incredible amount of data with corresponding cost implications. The conflict could be solved and, thus, technology could unveil its own potential, if only auditors themselves learn how to deal with the significant increase in data quantity. Another aspect to consider with reference to audit procedures is that technology might introduce new sources of evidence, not all of which will come from traditionally "secured" sources (data from social networks and data provided by external providers). However, until regulations and audit standards guide auditors on how to manage different data sources, it is not obvious that auditors will feel confident using such data, especially considering the fact that their need for legitimacy might lead to new quality-threatening behaviours. Finally, new technologies may radically change the role and manner in which certain audit procedures are conducted. If we consider internal audit reviews, for example, it is not clear whether the way these are currently carried out (i.e. the senior auditor reviewing the working papers of the junior auditor) will necessarily be the right approach in the future.

With reference to team processes and emergent states, data mining, data analytics as well as cognitive technologies may affect the work of audit teams in many respects. Firstly, the adoption of new technologies and the need to involve IT specialists in auditing teams, as reported in [Section 4.1](#), can contribute to generating task conflicts and relationship conflict, with potential effects on team performance and team member satisfaction ([Shaw et al., 2011](#)). This may be due to the knowledge relatedness of auditing versus IT specialists or, on the other hand, to the sense of belonging to different professions and the reciprocal respect that sub-teams show amongst each other. Secondly, the adoption of new technologies may alter the effects of auditing team management controls. The literature has argued that clan controls are present in extreme forms in accounting firms, to encourage staff to work toward the goals of

the firm and their relevance may decrease (Pierce and Sweeney, 2005). In fact, the adoption of communication technologies can transform the role of informal communication in socialising auditing staff and may require new formal quality controls over how audit work is performed (the audit process) and supervised (audit supervision). Thirdly, the perceived technical advantage of IT people over other members of the team may influence a leader's judgement and introduce some bias. One possibility is that leaders could consciously or unconsciously leverage such a perceived advantage to instill more arguments based on new technologies into the audit team's conclusions and provide only one-sided reasoning, neglecting important elements of traditional audit procedures. Additionally, the perceived advantage can reduce supervisors' active interventions in directional goals and weaken their quality control role (Peecher *et al.*, 2010).

Apart from these considerations derived from the analysis of the literature on audit teams, there are other aspects that emerge from the adoption of new technologies, which may open new avenues for future research. One of these aspects relates to team development. The existing literature on audit teams and recent contributions on how the emergence of new technologies affects auditing work seem to adopt an equilibrium model of the team (Carley, 1991; Gersick, 1991; Brown-Liburd *et al.*, 2015), in which a stable pattern of behaviours of its members is assumed. However, the emergence of new technologies may require a shift from the equilibrium of auditing teams' composition and functioning described in the literature, and practiced in reality, to a new order that reflects the effects of technological change. In fact, this change is disruptive enough to trigger a re-evaluation of composition, routines and leader interventions to achieve a new equilibrium (Morgeson, 2005). The latter seems to be the focus of current studies that explore the impact of new technologies (Appelbaum *et al.*, 2018; Issa *et al.*, 2016; Kokina and Davenport, 2017; Zhaokai and Moffitt, 2019) [16]. However, researchers should also investigate the transition from the previous equilibrium (pre-emergence of new technology) to the new equilibrium (post-emergence of new technology). It may be that auditing firms must plan and govern this transition carefully. This requires assuming a more dynamic view of investigating and leading audit teams by adopting a life cycle and multi-period model, in which the various phases of team development after the adoption of new technologies are identified and specific interventions devised (Arrow, 1997; Dowling, 2008). This may necessitate, for example, the consideration that the potential benefits of new technologies will not necessarily be immediately available or that the praised higher efficiency emerging from new technologies in auditing work manifests itself immediately, but may be preceded by periods of inefficiencies due to the need to understand and become familiar with the new technologies.

The literature has so far also neglected the power dynamics of auditing teams. Change may drive power and prestige re-ordering within the auditing team, as a result of team member capabilities. With the adoption of new technologies, members equipped with better IT skills may be more likely to express power and, therefore, direct team members' actions. This may potentially turn the traditional ranking of professionals within audit teams upside down, with unexpected and unpredictable effects derived from a heterarchical authority. While this is not negative *per se*, it can bear the risk of a lack of clearly accountable structures and dangerous competition dynamics to affirm status and legitimation, which may distract the time and effort of auditing team members from the core purpose of achieving high-quality auditing. Finally, when the COVID-19 pandemic surfaced globally, this had temporary but strong implications for the work of audit teams and most likely affected them in the long term. The implications are clear from the auditing firms' side, which has weakened the possibility of using and exercising effective monitoring by means of informal controls and leveraging more on action controls. Researchers, however, still need to reveal the behavioural and motivational reactions from the individuals' points of view, especially in terms of the visibilising practices that team members will put in place to signal the amount of work done and their commitment spent on the auditing work. Another aspect that needs to be uncovered is how individuals react to the need to feel belongingness and connectedness with others as well as to the lack of information and

feedback deriving from meetings in person and informal interactions, particularly critical for less experienced employees. This, in particular, may cause a high level of stress deriving from the lack of social support from peers during work and from communication filtered by digital means ([Delfino and van der Kolk, 2021](#); [Dannemiller, 2025](#)). One further aspect relates to the relationship with the clients, given that communication filtered by technology affects the perceptions of clients as being less cooperative and responsive to information requests ([Jenkins et al., 2024](#)). In addition, audit teams are now facing new challenges and opportunities linked to technological developments. In particular, the rise of generative AI tools, such as ChatGPT, is beginning to influence how audit tasks are carried out, for instance in documentation, fraud detection, or risk analysis. These changes are still emerging, but early signs from working papers (e.g. [Eulerich and Wood, 2023](#)) and practitioner reports (e.g. CAQ report on auditing in the age of generative AI, [2024](#)) suggest that such tools may reshape team dynamics, affect collaboration and redefine certain roles within audit teams. While this literature is still developing, it points to a new phase in which audit teams will likely need to adapt not only to post-pandemic ways of working but also to the integration of intelligent tools into their everyday practices.

In summary, the expected outcomes of mining, analytics, cloud, cognitive and communication technologies on audit teams are uncertain because, while we can speculate on the effects that new technologies may produce, individually and jointly considered, these results depend on how audit teams will be re-structured and function. The impact of new technologies on audit outputs will be mediated by their direct and indirect effects on the inputs, audit procedures, team processes and emergent states of audit teams. In particular, data mining, data analytics, cloud technologies and the more recent cognitive technologies will certainly directly affect auditors' skills and competencies and audit teams' composition: auditors need to incorporate technological competencies in their education background to interact with technological specialists; and audit teams need to incorporate technological specialists (e.g. data scientists, data engineers) to deal with the most complex data problems that require a high level of technological background. Cognitive technologies (Artificial Intelligence) will require a rethinking of the review process (e.g. verification of the output generated by AI technology) and the introduction of new forms of control of the team that incorporate new dimensions (e.g. control of the behaviour of audit teams' members in relation to data security, privacy and bias). As a result, these effects will in turn generate an indirect impact on how teams are coordinated and led. The co-presence of different bundles of competencies within audit teams will require a rethinking of the leadership and its competencies as well as of the forms of accountabilities. At the same time, communication technologies will have a direct impact on information processing and team interaction by introducing new technology-mediated forms of communication and on audit procedures by transforming how brainstorming sessions and audit reviews are conducted. Indirectly, these technologies will boost the potentialities offered by remote work and require new forms of control consistent with a work characterized by less observability and informal interaction. Taken together, these effects will affect the emergent states of audit teams, contributing in this way to the development of new audit identities that will transform the profession ([Horton and de Araujo Wanderley, 2018](#)). To deal with this transformation, it will be necessary to activate the change management process that the institutional literature recalls. It will require a thorough understanding of the current and future states of auditing teams as well as of their transition, which involves much more than a knowledge of the formal roles and rules; it will require an appreciation of the habits and routines of team members and the underpinning assumptions which are taken-for-granted in their day-to-day operations. Only in this way will it be possible to overcome potential sources of resistance deriving from possible competing interests, lack of capability, knowledge and expertise necessary to deal with new hardware and software systems and "mental allegiance" related to the established ways of thinking and doing ([Burns and Scapens, 2000](#)) (see [Figure 7](#)).

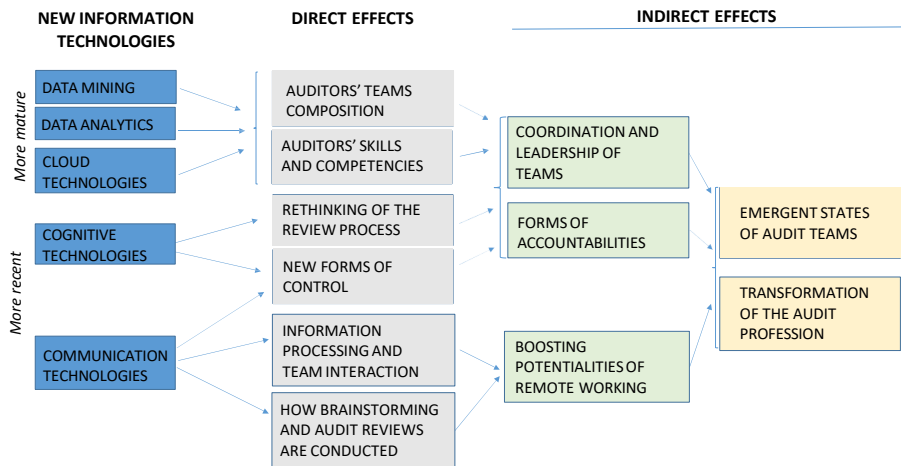


Figure 7. Direct and indirect effects of new information technologies on audit teams. Note: Figure 7 shows a summary of the direct and indirect effects that the introduction of new technologies produces on the structure and functioning of audit teams. Source: Authors own work

From a regulation point of view, we believe that policymakers and regulators can play a key role in this transformation process. First, the use and therefore the effects of new sources of data and technologies will not be substantial unless the ways in which they are used are not incorporated into audit standards (Gepp *et al.*, 2018). In September 2024 IASB issued the IAASB's Technology Position Statement, outlining how technological developments are being integrated into its ongoing and future standard-setting activities. The Board recognized technology's transformative potential for enhancing audit and assurance quality and its commitment to promoting its responsible adoption by practitioners [17]. Until then, we may expect that audit firms will not take full advantage of their adoption. Second, given that team composition has become and is becoming more and more important as a result of the introduction of new technologies, policy makers and regulators should reflect upon the opportunity to propose criteria on the structure and composition of audit teams in terms of, for example, seniority, diversity and the inclusion of specialists. Furthermore, they might also consider the opportunity to make the disclosure of this structure and composition recommended or even mandatory, in order to increase transparency on dimensions that can contribute to the assessment of audit quality. In this respect, in November 2024, the PCAOB proposed to the SEC an expansion of existing disclosure requirements. While the current Form AP requires firms to identify the lead engagement partner and other participating audit firms, including their locations and hours contributed, the new proposal sought to include additional information on audit team composition, hours and the use of specialists. However, the proposal was withdrawn in February 2025 before receiving SEC approval. Finally, regulators should monitor the rise of remote working, derived from the adoption of new technologies and policy makers and regulators should consider the opportunity to suggest minimum presence requirements and direct interaction within the audit teams and with the client, to make the audit work more effective.

To conclude, while our aim was to cover the most important dimensions related to the functioning of audit teams, we acknowledge that our review focuses on a selected group of leading journals that allows us to incorporate more rigor and comparability in our analysis. We are aware that valuable research on audit teams is also published in other outlets and formats that fall outside our review's scope. Such studies often examine distinctive institutional settings or cultural factors, which prior literature has shown to be important in shaping audit

practice (e.g. [Eierle et al., 2021](#); [Lam et al., 2024](#)), and they could provide additional perspectives that enrich and complement our findings. As a result, our conclusions may have limited generalizability and future research could provide valuable contributions by systematically incorporating evidence from these additional sources.

As a final thought, we notice that while technology is advancing at an incredible speed, audit professionals, academics, policy makers and regulators are proceeding at a much slower and more misaligned pace. To overcome this gap, these actors must adopt a more proactive approach to fully embrace the benefits emerging from this technological revolution.

Appendix 1

Table A1. List of papers analysed

Authors	Year	Journal
Agoglia, Hatfield and Lambert	2015	AOS
Agoglia Beaudoin, Tsakumis (a)	2009	BRIA
Agoglia, Brazel and Hatfield (b)	2009	AJPT
Agoglia, Brazel, Hatfield and Jackson	2010	AJPT
Agoglia, Kida and Hanno	2003	JAR
Asare and Wright	2018	BRIA
Bailey, Daily and Phillips	2011	BRIA
Bauer, Humphreys and Trotman	2022	AJPT
Bauer, Estep and Malsch	2019	CAR
Behn, Carcello, Hermanson and Hermanson	1999	CAR
Bhattacharjee, Maletta and Moreno	2017	BRIA
Bik and Hooghiemstra	2017	AJPT
Bobek, Feustel and Vandervelde	2021	BRIA
Boritz, Kochetova-Kozloski and Robison	2015	TAR
Boritz, Kochetova, Robinson and Wong	2020	BRIA
Brazel, Agoglia and Hatfield	2004	TAR
Cameran, Ditillo and Pettinicchio	2018	EAR
Cahan, Che, Knechel and Svanström	2022	CAR
Carpenter	2007	TAR
Che, Langli and Svanström	2018	AJPT
Chen, Chen, Chin and Lobo	2020	TAR
Chen, Trotman and Zhou (a)	2015	TAR
Chen, Khalifa and Trotman (b)	2015	AJPT
Christensen Newton and Wilkins	2021	AOS
Clor-Proell Kadous and Proell	2022	AJPT
Contessotto, Knechel and Moroney	2019	AJPT
De Simone, Ege and Stomberg	2015	TAR
Dennis and Johnstone	2018	AOS
Dowling	2009	TAR
Dowling and Leech	2014	CAR
Downar, Ernstberger and Koch	2021	AOS
Downey	2018	AJPT
Downey and Bedard	2019	AJPT
Downey, Obermire and Zehms	2020	AJPT
Epps and Messier	2007	AJPT
Estep	2021	TAR
Etteredge, Bedard and Johnstone	2008	BRIA
Favere-Marchesi	2006	BRIA

(continued)

Table A1. Continued

Authors	Year	Journal
Gissel and Johnstone	2017	AJPT
Guénin-Paracini, Malsch and Paillé	2014	AOS
Guénin-Paracini, Malsch and Tremblay	2015	AJPT
Gul Lim, Wang and Xu	2023	AJPT
Gupta, Umanath and Dirsmith	1999	BRIA
Han, Jamal and Tan	2011	AJPT
Harding and Trotman	1999	CAR
Harding and Trotman	2009	AJPT
He, Li, Monroe and Si	2021	AJPT
Hoffman and Zimbelman	2009	TAR
Hossain, Yazawa and Monroe	2017	AJPT
Huang, Lin, Chen and Hairston	2022	EAR
Hux	2021	AJPT
Jenkins, Negangard and Oler	2018	CAR
Kadous, Proell, Rich and Zhou	2019	CAR
King	2002	TAR
Knechel and Payne	2001	AJPT
Lee, Nagy and Zimmerman	2019	TAR
Maso, Lobo, Mazzi and Paugam	2020	CAR
McAllister, Blay and Kadous	2021	TAR
Messier, Owghoso and Rakovski	2008	JAR
Moroney	2007	AJPT
Murthy and Kerr	2004	AJPT
Nelson and Proell	2018	TAR
Nelson, Proell and Randel	2016	TAR
Owghoso, Messier and Lynch	2002	JAR
Peecher, Piercey, Rich and Tubbs	2010	TAR
Pickerd, Summers and Wood	2015	BRIA
Proell, Zhou and Nelson	2022	TAR
Russo, Meloy and Wilks	2000	MS
Seckler, Gronewold and Reihlen	2017	AOS
Sunderland and Trompeter	2017	AJPT
Tan and Jamal	2001	TAR
Tan and Jamal	2006	CAR
Taylor	2000	CAR
Trotman, Bauer and Humphreys	2015	AOS
Trotman, Khalifa and Simnett	2009	CAR
Trotman, Wright and Wright	2005	TAR
Wang, Tu and Zhao	2015	AJPT
Westermann, Bedard and Earley	2015	CAR
Yen	2012	BRIA

Note(s): Appendix 1 presents the list of the papers used and analysed in our literature review on auditing teams

Source(s): Authors' own work

Notes

1. For the purpose of this study, we adopt the classification of emerging technologies proposed by Manita *et al.* (2020), which reflects the evolving role of technology in the auditing profession. According to their framework, key technologies include data mining, defined as the process of extracting relevant information from large data sets; data analytics, defined as the science of analysing, interpreting and communicating data to support decision-making; cloud technologies, which enable remote storage and access to data and software; and cognitive technologies, which involve training machines to replicate human reasoning processes, drawing on artificial intelligence and machine learning. Some of these technologies are more established (data mining, data analytics and cloud technologies), whereas some others (cognitive technologies) are still in the process of

being adopted (Thomson Reuters Institute, 2024). We also refer to communication technologies (Murthy and Kerr, 2004; Moll and Yigitbasoglu, 2019) defined as digital tools and platforms that facilitate the efficient and secure exchange of information.

2. Available at <http://www.prisma-statement.org/Extensions/Protocols>.
3. The period was chosen in relation to documented regulatory and institutional transformations in auditing research and practice. The early 2000s represent a structural inflection point in the auditing environment. Following major corporate scandals (e.g., Enron, WorldCom), the introduction of the Sarbanes–Oxley Act (2002) and the establishment of the PCAOB fundamentally reshaped audit oversight, auditor accountability, internal control reporting and governance structures. DeFond and Zhang (2014), in their comprehensive review of archival auditing research, document how post-SOX regulatory reforms significantly altered the institutional setting in which auditors operate, with implications for audit quality, reporting incentives and research agendas. Similarly, Humphrey *et al.* (2009) describe what they consider a global audit regulatory shift, highlighting that regulatory restructuring during the early 2000s extended beyond the USA and reshaped oversight and professional structures internationally. Together, these contributions identify the early 2000s as a period of substantial regulatory and institutional transformation in auditing. In parallel, auditing has undergone increasing technological change over the past two decades, including the growing integration of data analytics, digital audit tools and automated procedures into audit processes. These developments have influenced audit methodologies, evidence collection and team organization, thereby directly affecting the study of audit teams.
4. Consistent with prior high-quality literature reviews in accounting and auditing (e.g., DeFond and Zhang, 2014; Simnett and Trotman, 2018), this review focuses exclusively on peer-reviewed journal articles to ensure comparability, scholarly rigor and transparency of the selection process. While book chapters and professional publications may offer valuable conceptual insights, their editorial and review processes are more heterogeneous. We acknowledge that this choice may exclude relevant contributions outside peer-reviewed journals.
5. TAR, CAR, AOS, RAST, JAR and JAE are consistently top-ranked accounting journals irrespective of topical area or methodology and are included in prominent ranking lists (for example, they constitute the “FT50” journals used in business school research rankings). AJPT and BRIA are the premier specialty journals for auditing research and behavioral accounting research, respectively, whereas JAPP captures research at the intersection of auditing and public policy. We also include EAR to be completely in line with another relevant review literature in auditing (e.g., Simnett and Trotman, 2018).
6. To implement our search strategy, we used the Business Source Ultimate (BSU) database. Importantly, our review is journal-driven rather than database-driven. The primary inclusion criterion is the publication outlet: we focus on a predefined set of leading accounting and auditing journals, consistent with prior review studies (e.g., Simnett and Trotman, 2018). The database therefore serves as a retrieval platform rather than as a determinant of the study’s scope. Given that our inclusion criteria are defined *ex ante* by journal list and time window (1999–2023), alternative multidisciplinary databases that index the same journals would yield the same population of eligible articles. Business Source Ultimate was used to operationalize the predefined search strategy, as it enables filtering by specific journals and restriction to peer-reviewed publications, thereby supporting structured and replicable searches across titles and abstracts.
7. On the basis of SNA, a network is made up of nodes linked by ties, in which the nodes are the actors and the ties are the connections between the actors (Scott, 2000).
8. Centrality refers to the level at which a node (a paper in our case) is connected to others in the network, expressing that it is “influential” or “important” in the network. In-degree centrality is related to the importance that is given to a node by the other nodes in the network.
9. The density of a network is calculated as the total number of ties divided by the total number of possible ties.
10. To proceed with SNA, it is necessary to create a symmetrical binary matrix $N \times N$, where N represents the number of papers analysed, i.e. 79 in our case. The matrix reports whether one paper (row) cites another one (column) in the sample and is filled by inserting 1 when the event occurs and

- 0 otherwise. As self-citations are impossible in this setting, they are, therefore, automatically assigned a 0. The binary matrix is the reference point for calculating the network properties.
11. Such as experts who have expertise in a field other than accounting or auditing, e.g. actuaries, real estate appraisers and tax experts.
 12. As an example, the EU's Eighth Directive, issued in 2006, requires the lead audit engagement partner to be identified in the audit report. Some European countries had their own partner disclosure rules prior to this Directive, e.g. France, Germany, Luxembourg and Italy (Carcello and Li, 2013, p. 1515).
 13. Sequential unpacking means providing pieces of information on fraud risks related to different items (e.g. receivables and revenues) one at a time, instead of revealing all the information in one go.
 14. A "pre-mortem" strategy consists of taking a "backward-looking" approach where auditors try to project themselves in a hypothetical scenario where, after the audit is completed, accounting fraud is discovered, which the auditors were not able to prevent.
 15. Cost-quality conflict in the audit environment refers to the difficulty that auditors have in achieving the appropriate balance between delivering a high level of quality service and controlling audit costs. Previous literature has documented that this conflict might generate distortions (Malone and Roberts, 1996; McNair, 1991; Otley and Pierce, 1996), such as quality-threatening behaviours and the under-reporting of time. For example, auditors might sign off opinions prematurely or under-report the number of hours allocated to different engagements.
 16. One exception is, for example, Dowling (2008).
 17. Projects are ongoing on the revisions to ISA 500 (Audit Evidence), ISA 330 (The Auditor's Responses to Assessed Risks) and related updates to ISA 520 (Analytical Procedures). These revisions aim to integrate Automated Tools and Techniques (ATT) and data analytics into auditors' approaches to evidence gathering, risk assessment and analytical procedures, with final approval of the revised standards scheduled for December 2027. In the same vein, in June 2025, the IAASB launched its Technology Quality Management initiative to examine how firms apply ISQM 1 and ISA 220 (Revised) in the use of emerging and complex technological tools in audit and assurance engagements. The project seeks to identify whether additional, non-authoritative guidance could support the consistent and public interest-oriented application of such technologies.

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Corresponding author

Angela Kate Pettinicchio can be contacted at: angelakate.pettinicchio@unicatt.it