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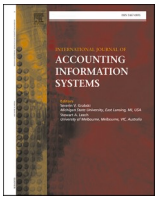

Emerging digital technologies and auditing firms: Opportunities and challenges

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ABSTRACT

This article aims to analyse the impacts of new technologies, namely robotic process automation (RPA) and artificial intelligence (AI), on auditing firms. In particular, we focus on the companies' everyday activities, organisational structure, hiring practices, and the competitive gap between Big4 and non-Big4 auditing firms. To this end, the article is based on a field study involving 14 auditing companies, both Big4 and non-Big4, from the list provided by Consob. The results reveal auditors' differing perceptions and opinions regarding the future of auditing firms. According to the first viewpoint, new technologies will have a positive impact on auditors as they will be allowed to focus on value-added activities. Second, some respondents do not expect changes to the traditional structure of the companies due to the application of digital tools, while other auditors hypothesised two different scenarios regarding structural changes. Third, the interviewees contend that auditors of the future should gain IT and data analytics skills, which could affect the hiring practices of these companies. Fourth, regarding the current differences between large and smaller firms, some participants stated that emerging technologies could widen that gap, while some auditors of non-Big4 firms claimed that modern tools offer an opportunity for the smaller companies to slightly reduce the gap. In sum, the findings reveal that, although RPA and AI are not widely used and the impact of these technologies on auditing firms is controversial, multiple changes are on the horizon in this regard.

1. Introduction

According to Raphael (2017), chief innovation officer at Deloitte, New York, the implementation of innovations, including modern digital technologies, is leading to 'a transformed audit process' where, for example, audit procedures are 'a direct consequence of available technologies' (Issa et al., 2016). Some auditors argue that several audit procedures may be suitable for automation (Moffitt et al., 2018); thus, there is a 94 % probability that automation will replace accountants and auditors as modern technologies allow automatizing a wide range of routine and non-routine cognitive tasks (Frey and Osborne, 2017). According to a World Economic Forum (2015) report, 75.4 % of 816 IT and communications executives and experts believe AI will perform 30 % of corporate audits by 2025. Therefore, emerging digital technologies are expected to create new opportunities and risks in the accounting and auditing professions (Dyball and Seethamraju, 2021).

Auditors are significantly lagging behind their clients in the adoption of new technologies (Oldhouser, 2016). This delay could be due to various reasons, ranging from 'the conservatism and rigidity of the profession as well as the calcifying effect of increasingly

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obsolete regulation' (Dai and Vasarhelyi, 2016) to the auditors' mindset (Cao et al., 2022; Schmidt et al., 2020). Nevertheless, if auditing firms do not exploit modern tools, companies such as Google or fintech start-ups could begin offering similar services (Richins et al., 2017). Therefore, auditors' skills, tools, and activities are rapidly changing (Dyball and Seethamraju, 2021).

Among the emerging technologies, the ones useful in automatizing routine tasks (i.e., robotic process automation or RPA) and non-routine tasks and those useful in supporting decision-making (i.e., artificial intelligence or AI) have gained particular attention from scholars and practitioners (Frey and Osborne, 2017) as they are able to simplify auditors' activities and influence the audit profession and the structure of audit firms (Fedyk et al., 2022; Huang et al., 2022; Kokina et al., 2021; Moffitt et al., 2018). As stated by Bakarich and O'Brien (2021), of the latest developments, RPA and machine learning (a subset of AI) have become increasingly prevalent in public accounting, with numerous current use cases driving its adoption in the industry. However, Moll and Yigitbasioglu (2019) highlight the need for further studies to elucidate new requirements in accounting, including new roles and skills. Similarly, others argue that the impact of innovative digital technologies on the auditing profession has not been sufficiently investigated (Appelbaum et al., 2018; Earley, 2015; Issa et al., 2016; Krieger et al., 2021; Lamboglia et al., 2020; Moffitt et al., 2018; Salijeni et al., 2019).

Based on these considerations, this article aims to analyse the impacts of new technologies such as RPA and AI on auditing firms. In particular, we focus on the following research questions:

1) What impact will new technologies have on auditors' everyday activities?
2) How will new technologies change the organisational structure of auditing firms?
3) How will new technologies change the hiring practices of auditing firms?
4) To what extent will new technologies influence the competitive gap between Big4 and non-Big4 companies?

To answer these questions, we conducted a generalized qualitative research study, which is a qualitative study or a field-based study (Yin, 2015). Data were collected through semi-structured interviews with 14 representatives of the most relevant Big4 and non-Big4 auditing firms operating in Italy between January 2020 and November 2021. Among the interviewees, a diverse range of positions within the company was represented, spanning from manager to partner. Specifically, four participants held roles as auditors in Big4 firms, nine were members of international auditing networks, and one was employed by a national firm.

The main results show that 1) new technologies will have a positive impact on auditors' everyday activities by allowing them to operate more efficiently and effectively; 2) the technologies will not replace the auditors but could cause a workforce reduction, which may impact the traditional hierarchical structure of companies; 3) since IT and data analytics skills will be increasingly required, IT auditors will be needed, and 4) according to some auditors, novel technologies could widen the gap between large and small companies, while according to others, modern tools could represent an opportunity for smaller companies to narrow the gap slightly.

In comparison to extant studies, this paper focuses not on the effects of new tools on audit quality (De Santis and D'Onza, 2021; Lugli and Bertacchini, 2022), corporate governance (Manita et al., 2020), or external reporting (Al-Htaybat and von Alberti-Alhtaybat, 2017) but rather on auditing companies. Additionally, while most studies focus on only one technology, such as RPA (Cohen and Rozario, 2019; Cooper et al., 2019; Huang and Vasarhelyi, 2019; Moffitt et al., 2018) or AI (Issa et al., 2016; Kokina and Davenport, 2017), this study considers both RPA and AI.

The paper is organised as follows: The next section provides a literature review, while section 3 describes the methodology adopted. Sections 4 and 5 illustrate the key findings and their discussion, respectively. Finally, the last section presents the conclusions while also underlining the major contributions and limitations of the study.

2. Literature review

Digitalisation is considered one of the most relevant changes and challenges in today's society due to its impact on everyday life. 'Digitalisation' is a term used to describe a broad and complex spectrum of technologies and phenomena (Vial, 2019; Warner and Wäger, 2019). Some auditors argue that a broad array of technologies can support the various activities they perform; for each type of task, there is a viable tool. In this regard, Abdolmohammadi (1999) investigated 332 audit tasks and noted that 80 % of these tasks are structured or semi-structured; consequently, Kokina and Davenport (2017) argue that they are suitable for automation. In the following sections, we will discuss the primary features and potential effects of two transformative technologies (RPA and AI) on auditors and the audit industry as a whole.

2.1. RPA in the auditing sector

RPA enables auditors to automate structured, repetitive, and rule-based audit tasks, such as reconciliations, internal control testing, and detail testing (Cohen and Rozario, 2019; Huang and Vasarhelyi, 2019; Moffitt et al., 2018). This tool is particularly suitable for automating tasks in the presence of the following attributes: 1) stable environment – processes that have reached a mature state and undergo infrequent changes; 2) rules-based – processes adhere to predetermined steps and do not rely on human judgment; 3) low complexity – processes with few exceptions and data sources; 4) high volume of transactions – processes that occur frequently; 5) structured data – processes that are based on structured data such as organized text and numbers and not on unstructured data such as pictures, videos, etc.; 6) repetitive – processes that consistently repeat in the same manner; 7) accessing multiple systems – processes that require interacting with multiple distinct software programs; 8) clear understanding of manual costs – processes for which the amount of time and energy required to perform are well-defined and can be documented; 9) digital data – processes that involve utilizing data in a digital format; 10) high error rate – processes susceptible to human errors (Eulerich et al., 2022).

Although tools such as Excel macros, CaseWare IDEA, Python, and R allow auditors to automate various tasks, unlike these software, RPA does not require user-level interface programming (Moffitt et al., 2018). Nevertheless, utilizing this tool entails a series of sequential actions for companies, including selecting the appropriate procedure, modifying audit programs if needed, procuring licenses from RPA providers or developing in-house programs, and finally, conducting field tests to evaluate the effectiveness of the assigned tasks performed by RPA programs (Huang and Vasarhelyi, 2019).

Moffitt et al. (2018) demonstrated that RPA could assist auditors in revenue testing, which is a fundamental area of audit focus. Through automated processes, RPA can conduct tasks such as reconciliation, analytical procedures, internal control testing, and substantive testing (Moffitt et al., 2018).

2.2. AI in the auditing sector

Though RPA can compute only structured tasks, AI can perform semi-structured and unstructured tasks (Zhang, 2019), including those that normally require human intelligence (Raphael, 2015; Zhang et al., 2022a). Artificial intelligence, including a set of technologies such as natural language processing (NLP), natural language generation (NLG), computer vision, machine learning, virtual agents, and cognitive computing (Zhang, 2019), can automate all auditing phases, making the auditing process an assembly line in which an output from one phase becomes an input in the consecutive step (Issa et al., 2016). For instance, Appelbaum and Nehmer (2017) developed a framework within which to implement audit drone automation: drones can support auditors in performing tasks such as physical inventory. Moreover, by using NLP, it is possible to review a large number of contracts (Zhou, 2017), while the application of NLG enables the generation of texts or speeches from structured information, including financial analysis reports and statistics regarding a company's performance (Gotthardt et al., 2020). Moreover, machine learning algorithms can automate more complex tasks (Krieger et al., 2021), and they are suitable for detecting anomalies and accounting fraud (Bao et al., 2020; Fedyk et al., 2022; Perols, 2011).

Such modern tools (e.g., machine learning and text mining) have also allowed the analysis of unstructured and non-financial data, such as mail, newspaper articles, and even big data.[1] This development will strongly transform the way auditors make decisions and collect audit evidence (Brown-Liburd et al., 2015). Traditionally, auditors analyse accounting and financial data using computer-assisted audit techniques (CAATs) and generalised audit software (GAS) (Alles and Gray, 2016; Brown-Liburd et al., 2015). Although this software enables auditors to automate various audit tasks (Widuri et al., 2016) and extract and analyse data (Ahmi and Kent, 2013), they have limited advanced statistical techniques, and they are not able to import non-financial information (Brown-Liburd et al., 2015).

2.3. The multiple impacts of RPA and AI on auditors' activities and auditing firms

RPA and AI enable auditors to perform activities more effectively and efficiently (Cooper et al., 2019; Huang and Vasarhelyi, 2019; Issa et al., 2016). While the automation of audit work can improve audit efficiency, a deep analysis of the data from the client can enhance audit effectiveness (Krieger et al., 2021). In addition, by automating tasks, auditors can allocate more resources to judgment activities (e.g., fair value investment estimation) and the investigation of potential anomalies, thereby increasing audit quality (Moffitt et al., 2018) and focusing on the most important (Fedyk et al., 2022), complex, and valuable activities (Kend and Nguyen, 2020; Manita et al., 2020; Zemánková, 2019). In other words, AI and robotics reduce auditors' manual intensive tasks and provide them more time to apply their minds and skillsets to tasks requiring critical evaluation. Consequently, new technologies allow auditors to move more quickly to audit activities that require judgment (Agnew, 2016a) and generate more value. Moreover, the focus on value-adding and interesting activities, instead of mundane and repetitive tasks, could improve job satisfaction and, therefore, reduce employee turnover and cause more employees to view working for auditing firms as a career rather than a stepping-stone to other careers (Cooper et al., 2019; 2022). Finally, by strategically analysing customer data, auditors could provide useful insights and information to client companies and thus enhance processes, improve efficiency, and explore future issues (PwC, 2015).

Another aspect that should be considered is represented by the auditor–robot collaboration and interaction (i.e., the auditor's role). The relationship between automation and auditors has raised concerns in the past (Issa et al., 2016). A study by Frey and Osborne (2017) found that there is a 94 % probability that automation systems will replace accountants and auditors. Despite this, certain scholars and some Big4 firms' specialists have argued that auditors will not be made redundant (Agnew, 2016a, b; Cooper et al., 2019; Kokina and Davenport, 2017; Rapoport, 2016; Richins et al., 2017; Tiberius and Hirth, 2019). In the short term, new technologies are expected to replace specific job positions; in particular, RPA systems may replace the auditors in charge of data collection and processing (Agnew, 2016a; Kokina and Davenport, 2017). On the other hand, there will be an increase in jobs related to auditing activities that require professional judgment and social intelligence (Richins et al., 2017). In other words, digitalisation will 'change the activities' (Agnew, 2016a), but the robot will not substitute auditors as 'human intervention and judgment will always be the most valuable part of any audit' (Rapoport, 2016). Modern technologies will replace entry-level employees (Fedyk et al., 2022); as a result, the structure of auditing firms will remain the same, but the human component will resemble a pillar rather than a pyramid (Moffitt et al., 2018). The mentioned change in the auditors' everyday lives also implies a change in the organisational structures of auditing companies, characterised by the presence of multiple lower-level employees performing repetitive low-level tasks and their

[1] Gartner defines 'big data' as 'high-volume, high-velocity, and/or high-variety information assets that demand cost-effective, innovative forms of information processing that enable enhanced insight, decision-making and process automation' (Gartner, IT glossary: Big data).

hierarchical superiors reviewing these tasks and drawing subjective conclusions (Issa et al., 2016).

These changes will also have an impact on the skills an auditor should possess, as they are supposed to shift from being a data collector, processor, analyser, and disseminator to primarily being able to evaluate the results of automatized audit procedures (Moffitt et al., 2018). Data analytics and computer science skills, as well as skills such as data exploration, data visualisation, predictive modelling, data mining (Agnew, 2016b; EY, 2015; Richins et al., 2017; Tschakert et al., 2016), and auditing technology implementation (Tschakert et al., 2016), are becoming more important. However, although the skills required for future auditors vary according to the tools available (Appelbaum et al., 2021), cognitive and social skills are also in high demand (Ham et al., 2022). 'Accountancy is becoming more of a technical process based around the application of algorithms to increase operational efficiency' (Gardner and Bryson, 2021). This change could lead to senior accountants having difficulty understanding the audit process and exercising judgment due to a lack of training and practice in low-level audit activities (Gardner and Bryson, 2021). Therefore, the implementation of new technologies has prompted a change in the kinds of technical skills required by firms.

Additionally, accounting curriculum (Holmes and Douglass, 2022) and audit textbooks (Blix et al., 2021) should be changed to include content on data analytics. Although the incorporation of advanced analysis through modern tools into accounting programs is inevitable, the potential expenses associated with obtaining the modern software and the efforts required by academic staff to acquire new competencies could be expensive (Holmes and Douglass, 2022). However, audit textbooks are responding to these changes by incorporating information on data analytics, including an entire chapter or a brief mention as an additional tool (Blix et al., 2021).

Finally, advanced technologies could also affect the traditional gap between large and small enterprises. In Italy, the Big4 firms audit 66.41 % of unlisted companies and 88 % of listed companies (Lugli and Bertacchini, 2022). However, emerging technologies could change the effective market share of companies in the auditing sector. Firstly, the development of modern tools requires large investments (Bakarich and O'Brien, 2021); therefore, the gap between Big4 companies and mid-tier or smaller firms could be reinforced (Agnew, 2016a; Kend and Nguyen, 2020; Oldhouser, 2016). For instance, machine learning solutions require huge 'consulting and license fees and are therefore less accessible for smaller audit practices' (Bellinga et al., 2022). Secondly, higher IT expectations on the part of clients, who are more likely to use advanced technologies in the case of Big4 firms (Bakarich and O'Brien, 2021), and the inability of small companies to invest in AI and automation demands act as entry barriers for smaller auditors (Agnew, 2016a; Kend and Nguyen, 2020). Thirdly, employees of Big4 firms receive more training in modern technologies (Bakarich and O'Brien, 2021). Finally, the application of emerging technologies has increased the audit quality gap between Big4 and non-Big4 firms (Lugli and Bertacchini, 2022), as auditing firms' digitalisation influences audit quality (Rahman and Ziru, 2022). This quality gap occurs because modern tools enable auditors to increase 'the number of data analysed and thus the probability of detecting anomalies or incongruences in companies' transactions' (Lugli and Bertacchini, 2022).

3. Methodology

Since auditing digitalisation is an emerging phenomenon, a useful methodology in investigating the research questions is a generalized qualitative research study, namely a field-based study (Yin, 2015). We chose this study method because it is 'frequently used to explore new areas of research and to provide preliminary input to surveys where the topic can be investigated in greater breadth' (Lillis and Mundy, 2005) and suitable for investigating 'complex phenomena in a confined domain' (Lillis and Mundy, 2005). This qualitative method 'embraces a relatively small number of companies, as opposed to a wide-ranging survey or intensive case inquiries in two or three companies' (Roslender and Hart, 2003). Notably, on one hand, wide-ranging surveys do not generate a high level of insight into the research topic; on the other hand, intensive case inquiries provide insights into the practices examined but may not capture the broad range of practices (Roslender and Hart, 2003).

Data were collected through semi-structured interviews with Italian auditors. Semi-structured interviews, through an interactive process, enable exploring the perceptions and opinions of respondents while considering all aspects of interest and adapting to the specific situation (Wengraf, 2001). The initial sample comprised the 17 auditing firms indicated on the Consob list.[2]

Each auditing firm on the Consob list was contacted by email or phone, and three decided not to participate. For the companies that agreed to participate in the interviews, the administrative office assigned an auditor with skills in the research field. In particular, the interviewees possess specific knowledge of IT auditing and also operate as trainers in the use of the auditing firms' IT infrastructure; most of them are also acting as the auditor IT managers of the firm, thus operating in tight contact with IT engineers.

The semi-structured interviews were conducted with 14 Italian auditors between January 2020 and November 2021. Due to the COVID-19 pandemic, only the first interview was conducted face-to-face in the auditor's office. The remaining interviews were conducted remotely by 'Microsoft Teams' or by phone, whereas two firms, indicated with N/A in Table 2 under the descriptions 'interviewee's position' and 'interviewee's gender', decided to answer in writing.

The sample comprises all four Big4 firms, nine members of international auditing networks, and one national firm. The interviewees hold various positions in the firms, from manager to partner. There are some exceptions: one participant is an audit area director, as the company does not possess the traditional hierarchical structure characteristic of audit firms, while the interviewees of Company 8 and Company 9 hold the positions of audit service leader and data analytics director of company headquarters in Italy, respectively, as indicated with N/A in Table 2 under the description 'office location'. The respondents claimed that they conduct IT audits using tools such as Excel or CAAT software; in addition, eight of them have adopted data analytics tools, such as QlikView,

[2] Consob is the supervisory authority for the Italian financial products market. As established by Regulation (EU) no. 537/2014, Consob must annually publish a list of all the auditing firms that conduct public interest entities (PIE) assignments.

Power BI, and Tableau. Two companies have already adopted software such as Python or Alteryx to automate certain manual activities. Moreover, firm 13 has implemented an original in-house software program that can automatically perform most of the operational functions of the auditing process, leaving only the evaluation and conclusive phases of the process to the qualified auditor. In short, although a low percentage of auditors claimed that they regularly use both RPA and AI tools during their activities, 70 % of the respondents used RPA and AI in experimental projects with some pilot companies.

The main features of the interviews are summarised in Tables 1 and 2.

As requested by some interviewees and to guarantee their anonymity, the denomination of the companies, as well as the names of the auditors, are undisclosed. Therefore, a number has been assigned to each company within this paper.

Before starting the interviews, the interviewer indicated the purpose of the project and an overview of the key issues addressed during the interviews.

On average, the interviews lasted 45 min and were organised around four topics: 1) an analysis of the software and tools used by auditing firms and the investments needed for their implementation; 2) an investigation of the main benefits, risks, and challenges of the application of new RPA and AI software; 3) the impact of these modern technologies on the workforce and the organisation; and 4) changes in the professional profile of auditors.

Because some interviewees did not want the interviews recorded, notes were taken during the interviews. Thus, the data collection was validated by ensuring that the main topics that emerged were consistent with the studies present in the literature. In addition, the second researcher of this study has collected data with auditors not included in the sample and obtained results that are aligned with those of this study. Furthermore, the findings related to auditing firms 13 and 14 are free from bias, as they decided to participate in the project by answering the questions in writing. After this phase of data collection, the authors performed the data analysis manually, following the five analytic phases proposed by Yin (2015).

The key evidence is presented in the following sections.

4. Results

4.1. Digitalisation, auditors' tasks and auditing firms' organisational structure

Overall, the participants' expectations regarding the adoption of emerging digital technologies were positive.

> *'About IFRS16 […] the intelligent system [machine learning algorithms] could read all leasing contracts, highlighting anomalies and potential risks so that the auditor should only focus on the most relevant information. This could improve the quality of the auditing activity, as well as save hours and, consequently, be more efficient'* (Manager, Auditing Firm 4).
>
> *'The tools certainly make our work more interesting […]. The technologies [automation systems] will free us from the more boring and repetitive activities'* (Manager, Auditing Firm 3).
>
> *'Digitalisation allows a decrease of workload and a more equitable distribution of activities within the audit team without overloading one person over another'* (Senior Manager, Auditing Firm 5).
>
> *'Intelligent systems [artificial intelligence] must be tools to support human activities, used for carrying out more complex analyses or those requiring the processing of large amounts of data, activities that could not be carried out with [the] computer programs commonly used'* (Interviewee, Auditing Firm 13).

Improving the efficiency and effectiveness of auditing is the main benefit mentioned by the respondents. Based on the features of modern software programs, especially those useful for automatizing repetitive tasks (i.e., process automation tools or similar), the participants strongly believe that auditors can avoid time-consuming tasks and perform audits more efficiently and effectively, thus reducing human errors. Consequently, they can focus on activities that require professional judgment (e.g., in areas such as funds and depreciation). In addition, some interviewees perceive intelligent automation systems as useful tools in reducing auditing risks in general and those related to personal judgements in particular. Intelligent systems can support auditors' decision-making processes by highlighting relationships and anomalies and developing projections that humans cannot. In sum, while most of the auditors refer to new technologies as tools for improving the efficiency of auditing activities and allowing auditors to focus on value-added tasks (the reference here is mainly to process automation tools), some auditors highlight the potential benefits generated by intelligent systems (i.e., machine learning and artificial intelligence in general) in terms of improving the effectiveness of the auditing process.

One issue that emerged during the interviews concerns the relationship between technology and auditors (i.e., whether 'robots' can be substituted for humans). In general, the participants expect that auditing technologies will not replace auditors, as humans are still considered irreplaceable regarding judgemental and value-added activities even if the existing technological solutions can perform more complex analyses or those requiring the processing of large amounts of data. Therefore, the technological progress is expected to

Table 1
Description of Big4 firms' interviews.

Code	Interviewee's position	Office's location	Interviewee's gender
Auditing Firm 1	Partner	Ancona	Female
Auditing Firm 2	Partner	Bologna	Female
Auditing Firm 3	Manager	Ancona	Female
Auditing Firm 4	Manager	Bologna	Female

Table 2
Description of Nnon-Big4 firms' interviews.

Code	Member of an international network	Office's location	Interviewee's position	Interviewee's gender
Auditing Firm 5	Yes	Milan	Senior Manager	Male
Auditing Firm 6	No	Trento	Audit Area Director	Male
Auditing Firm 7	Yes	Rome	Senior Manager	Male
Auditing Firm 8	Yes	N/A	Audit Service Leader	Male
Auditing Firm 9	Yes	N/A	Data Analytics Director	Male
Auditing Firm 10	Yes	Pordenone	Manager	Male
Auditing Firm 11	Yes	Milan	Partner	Male
Auditing Firm 12	Yes	Verona	Partner	Male
Auditing Firm 13	Yes	Milan	N/A	N/A
Auditing Firm 14	Yes	Bologna	N/A	N/A

support rather than threaten the auditing profession. In this regard, one auditor provided the following example.

> *'The autopilot of an airplane didn't replace the human pilot, as it works for 80 % of the trip but, at crucial moments, the pilot must be in the airplane to manoeuvre it; otherwise, the plane could crash. For this reason, I see the auditor replacement [as] unlikely'* (Manager, Auditing Firm 10).

The notion that complete auditing automation is not practical is also supported by the experience of Auditing Firm 13. The interviewee noted that the company had not replaced its workforce since implementing its in-house intelligent software, which increased employees' knowledge levels and enhanced the collection of audit evidence.

> *'The introduction of intelligent systems in our company has not reduced the workforce employed but has improved, in qualitative and quantitative terms, the work of audit carried out. […] The components of artificial intelligence that characterise our software are not intended to replace the skills and professionalism of our resources, but they are used to increase their level of knowledge and enhance the collection of elements essential to the exercise of the auditor's professional judgment. Work integration human and intelligent systems must, therefore, be read to enhance capabilities professional and process and workflow optimisation'* (Interviewee, Auditing Firm 13).

However, even if a workforce replacement seems unlikely, some auditors hypothesised a reduction in low-level workers in the long term, as they perform manual and repetitive tasks that are most prone to automation through process automation tools. Consequently, this reduction will have an impact on the traditional hierarchical structure of auditing firms by making the base of the pyramid smaller.

> *'In the future, I believe that the auditing firms won't need a large number of juniors, as the manual and repetitive tasks will be carried out by bots. Some of such tasks, for example, are executed via outsourcing to "Delivery Centres" located in Greece. I expect that those activities that are carried out by humans in outsourcing will be performed by bots in the future […] . The classic pyramid can change, becoming more tapered and steeper as the people who carry out manual activities are replaced, at this time, by the staff present in the "Delivery Centres" and, then, gradually, by machines'* (Partner, Auditing Firm 1).

One auditor hypothesised a different scenario regarding auditing firm structure: in the future, there will be no need for intermediate professionals, because their activities will be performed by AI systems. Thus, the staff will set up and configure the modern tools, and skilled auditors will analyse the output of the software.

> *'I believe there may be a need for more managers and employees with more than five years of experience [who are] able to analyse data and are assisted by junior staff with a high level of mastery of data analytics tools. There may be a potential disappearance of intermediate figures with 2–4 years of experience. This change could have an impact on the structure'* (Senior Manager, Auditing Firm 7).

The impact of technologies on the traditional hierarchical structure of auditing firms is a controversial topic. In contrast to the above views, some participants do not expect any organisational change due to the application of emerging technologies; they stated that digital tools only affect internal procedures, company policies, methods, and auditors' skills.

> *'The traditional pyramid will not change, but there will be an integration of professional skills on the base of the pyramid. If I integrate new professional figures within the staff, I will not affect the pyramid shape or reduce the number of people, but, simply specialise them'* (Partner, Auditing Firm 11).
>
> *'The auditing firms have a structure that trains the resources. In fact, among the hired workers, one part continues to work in the company, while another ceases the employment relationship. In this way, high-level professionals accumulate a certain degree of experience. Consequently, we need to think about the organisational structure in terms of skills rather than form. The current structure is old for a thousand reasons, and it responds less to how we do our work. But this [is] today. Tomorrow, it is not said that this structure [will] not be valid. It may still be valid, but we should think about which skills we are hiring and which skills we want to train. It is an aspect that needs to be reasoned about'* (Partner, Auditing Firm 2).

In other words, it seems possible to identify three potential scenarios. In the first, the pyramid structure of auditing firms will be turned upside down due to junior auditors being replaced by RPA software. In the second scenario, the pyramid will have an hourglass

shape, as senior auditors will be replaced by AI systems. In the last scenario, the pyramid will retain its current structure, but its qualitative dimensions will change. Therefore, the impact of new technologies on the organisational structure of auditing firms is unclear.

4.2. Auditors' skillset and hiring practices

Most participants strongly believe that auditors will have to possess IT skills, as a thorough knowledge of computer science is required to master the modern tools. According to some respondents, beyond IT skills, data analytics skills will be increasingly valued. The general sentiment is that accounting and auditing competencies will continue to be relevant within auditing teams. The interviewees believe that, in the future, it will be optimal to have an 'IT auditor', a professional with an economic background who is able to manage modern platforms and tools. Currently, however, auditors lack these skills, partially due to the accounting degree programs, which should be revised to allow students to acquire the competencies demanded by companies. The auditors' sentiments regarding this topic are captured below:

> *'I think that IT and programming skills will be more and more demanded. Knowledge of Microsoft Office apps, like Excel, is no longer sufficient. I believe that these skills in computer and programming fields will have to have been acquired more in-depth already at the university level'* (Manager, Auditing Firm 3).
> *'IT skills and greater skills in data analytics will be demanded. So, the accounting graduate will have to evolve to draw their skills close to the world of work demands'* (Partner, Auditing Firm 2).
> *'With the adoption of new AI software, in the future, it will be required for professionals with auditing, accounting and IT skills to have, concurrently, skills in the fields of big data, data mining and the use of Expert Systems'* (Interviewee, Auditing Firm 13).

However, a few participants stated that the need for competencies in mathematics, statistics, and computer science, along with the difficulty of finding a professional figure with a background in those fields, would make it necessary to hire new workers.

> *'The auditing area should be geared towards figures like engineers, mathematicians and computer scientists, as they have some skills that the classical auditor does not have. I foresee an introduction of new figures to the auditing staff, rather than an expansion of the economists' knowledge, because current university programs are not changing direction'* (Partner, Auditing Firm 11).

Regarding the potential introduction of new professional figures, two auditors assumed a scenario based on the size of auditing firms. The manager of Auditing Firm 10 suggested that, among the Big4 and medium-sized firms, there would not be a need for an evolution of classic auditors' skills because these companies can create, for example, a specific team of computer scientists to support the auditors. In contrast, in smaller firms, professionals with an accountancy degree must inevitably be specialised in IT and data analytics.

> *'A small firm with 10–15 employees can't afford a team of computer scientists'* (Manager, Auditing Firm 10).

The senior manager of Auditing Firm 7 reported that the Big4 firms, having a specific client target, must introduce data scientists, engineers, and mathematicians.

> *'In companies such as ours, I still see a strong presence of the traditional professional figures such as economists and accountants'* (Senior manager, Auditing Firm 7).

4.3. The audit market in the future

New technologies will first affect the competitive advantage of large auditing firms or, more precisely, the competitive gap between Big4 and non-Big4 firms. All the interviewees belonging to Big4 firms and some of those belonging to non-Big4 firms stated that the emerging technologies could widen the current gap between large companies and other firms, as only the former can make the huge investments needed to buy modern technologies. Furthermore, modern tools are particularly suitable for large auditing firms because they have sizeable and digitalised audit clients.

> *'The gap will grow, as the Big4 firms have the possibility of investing in these tools [AI] that, certainly, cannot be addressed by smaller companies'* (Manager, Auditing Firm 3).
> *'The current difference between Big4 and non-Big4 firms could be accentuated. I don't want to be pessimistic, but I think that modern tools are particularly suitable for Big4 firms, which have big client companies to audit. These tools work efficiently with thousands of transactions, but in Italy, 95 % of the firms are small companies'* (Manager, Auditing Firm 10).

In contrast, some of the interviewees belonging to non-Big4 firms believe that the current gap could, in the medium–long term, remain unchanged or even reduce slightly. For example, the application of technologies allows smaller companies to become as competitive as Big4 firms by offering a higher quality service.

> *'The Big4 firms already have a competitive advantage over other companies and, without shocks or regulatory interventions, this advantage will be insurmountable. Thus, it is difficult for them to cannibalise even more. In my opinion, technologies are an opportunity to reduce slightly this gap. The software is expensive in the market introduction phase; then, with the entry of new manufacturers with additional technological solutions, even the smallest companies can buy modern tools that are getting cheaper. So, even if the Big4 firms*

will continue to have a large share of the market, new technologies are an opportunity to faintly reduce the gap. For example, if they currently hold 95 % of the market share, in the future, they will have 94 %' (Partner, Auditing Firm 12).

'It does not widen the gap, as, when even small auditing firms will adopt modern technologies, they can compete in the services that the Big4 offer' (Senior manager, Auditing Firm 5).

'The gap could decrease. For instance, if there were tools that allow you to have the entire office that Big4 has in the tool itself (e.g., anti-money laundering control), at that point, anyone could acquire the tool. It is clear that you become as efficient and effectiveness as a Big4' (Audit area director, Auditing Firm 6).

'In my opinion, the gap should not increase in the future, and the smaller ones could acquire market share from the big auditing firms. If I have to give a quantification, I don't think there will be a reduction in the gap before 4/5 years' (Partner, Auditing Firm 11).

In sum, the impact of emerging digital technologies on the gap between large and smaller auditing firms remains unclear. The Big4 auditors believe that the competitive gap will always remain, as large firms can make huge IT investments and have customers for whom the use of such technologies is convenient. In contrast, other auditors believe that it is a matter of time before technologies such as RPA and AI become applicable and affordable for small auditing companies with minor clients.

5. Discussion

The analysis reveals divergent opinions from the Italian auditors regarding the research issues; the digitalisation of auditing firms is thus open to debate. Based on the interviews, the application of new technologies is 'at the innovation stage where the ideas, usage and practice are all just starting to see their adoption in the audit and assurance services market, but not to a widespread extent' (Kend and Nguyen, 2020). Notably, Italian auditors are lagging in the adoption of advanced and emerging technologies such as RPA and AI, and they are mostly performing audit activities using tools such as Excel and CAAT. In addition, some of them have adopted data analytics tools such as QlikView, Power BI, and Tableau. According to Alles and Gray (2016), Italian auditors' focus is on structured data (i.e., financial and accounting data) analysed through traditional tools (e.g., Excel, ACL, and IDEA) and, recently, visualisation analytics (e.g., Power BI and Tableau). In contrast, the use of unstructured data (e.g., email, images, video, and audio) and advanced predictive analytics (Python and Matlab) is not widespread. This finding is consistent with the work of Aboud and Robinson (2022), which revealed that the use of data analytics for fraud detection is uncommon.

Concerning the audited companies, the interviewees also highlighted that 90 % of the Italian productive context comprises small and medium-sized firms that are unable to provide the auditor with data suitable for modern tools. For these firms, metaphorically speaking, '*possessing the advanced tools is like having a Ferrari to go in the middle of a gravel road*' (Manager, Auditing Firm 10). Thus, audit client size appears to be a contingent factor that can influence auditors' use of advanced tools (Dagilienė and Klovienė, 2019; De Santis and D'Onza, 2021). Thus, the auditors' reluctance to adopt advanced technologies could be due to the technological backwardness of their audit clients and their consequent inability to produce an adequate dataset. The present evidence highlights the relevance of having digitalised clients because, as stated by some Italian auditors, the advanced tools are particularly suitable for large companies that audit large companies. This finding is consistent with those of Gao et al. (2020); they concluded that the positive effects of data analytics were correlated with audit clients' characteristics, such as the complexity of business operations or accounting estimates and the degree of digitisation. Similarly, it is consistent with Eulerich et al.'s (2022) findings, which highlighted that RPA is particularly suitable for use with high transaction volumes and processes for which the data used is in digital format. Two auditors illustrated that, on the one hand, modern tools '*are instruments calibrated/suitable for big and large companies that have large numbers and work well with thousands of transactions*' (Manager, Auditing Firm 10), while, on the other hand, '*audit clients still send paper documents*' (Senior Manager, Auditing Firm 5).

According to previous studies (Al-Aroud, 2020; Cooper et al., 2019; Huang and Vasarhelyi, 2019; Issa et al., 2016), technologies are expected to have a positive impact on auditors' everyday lives, as they will be able to focus on value-added activities and delegate the repetitive ones to robots, thus improving audit efficiency and effectiveness. However, even if the new technologies are capable of automating several audit tasks, the contribution of auditors to the auditing process will also be crucial because, as stated by some respondents, many activities rely on auditors' professional judgement and are not suitable for automation (Krieger et al., 2021; Richins et al., 2017); in these cases, intelligent systems can support the auditors' decision-making processes by highlighting data relationships and anomalies and developing forecasts and projections. Therefore, to answer the research question of Issa et al. (2016): 'Will automation cause workforce replacement or supplementation in the auditing field?', in contrast to Frey and Osborne (2017), the participants do not believe that the auditor profession will become obsolete (Agnew, 2016a, 2016b; Cooper et al., 2019; Rapoport, 2016; Richins et al., 2017; Tiberius and Hirth, 2019). This finding supports the results obtained by Tiberius and Hirth (2019), which reveal that German auditors consider these technologies to be an opportunity rather than a threat. According to Zhang et al. (2022b), Italian auditors expect 'attended automation' (i.e., osmosis between professionals and technologies) to 'achieve human–machine synergy'.

Although a workforce replacement is not assumed by Italian auditors, some participants claimed that the automation of audit tasks could lead to a decrease in lower-level employees in the long term, as they perform activities that are more susceptible to automation (Agnew, 2016a; Kokina and Davenport, 2017). This reduction would affect the hierarchical organisation of the auditing firms through a narrowing of the base of the pyramidal structure (Moffitt et al., 2018). An interesting perspective provided by the senior manager at Auditing Firm 7 is that, in the future, there will be no need for intermediate professionals with 2–4 years of experience. Thus, the staff will set up and configure the modern tools, while the skilled and qualified auditors will analyse the output of the software. In contrast to these views, some participants do not expect organisational changes at all because of the application of emerging technologies;

according to them, digital tools only affect the company procedures and methods (Issa et al., 2016), as well as the skills required of the auditors (Appelbaum et al., 2017).

Regarding the impact on the auditors' skills, the interviewees' perceptions are substantially aligned. The participants believe that future auditors should gain IT and data analytics skills (Appelbaum et al., 2017; Felski, 2023); currently, auditors lack these skills (EY, 2015) due to the existing accounting degree programs (Kokina and Davenport, 2017). Although IT skills will become more relevant, accounting competencies continue to be of prime importance (Tiberius and Hirth, 2019); therefore, classic auditors' skills will have to evolve, which could lead to the definition of a new type of auditor, an 'IT auditor' (i.e., an auditor with an economic background who can manage modern technological platforms and tools). This result agrees with that of Appelbaum et al. (2021), who argued that it is important for future auditors to possess a sufficient level of knowledge to effectively and efficiently conduct audit analysis using modern tools. To date, however, Italian accounting graduates lack this type of skills; therefore, a transformation of the accounting curriculum seems necessary (Holmes and Douglass, 2022) to enable accounting scholars to acquire the skills required by auditing firms and to avoid being replaced by STEM degrees. In this regard, an auditor hypothesised the replacement of graduates in accounting with graduates in the IT field: '*In the future, staff with accounting skills and backgrounds will be replaced by staff with computer skills. However, this replacement will not be 1 to 1*' (Partner, Auditing Firm 12), while another speculated on the hiring of mathematicians and engineers to address the lack of skills among undergraduates in accounting (Partner, Auditing Firm 11).

The current competitive gap between Big4 and non-Big4 firms could also be subject to variations due to the adoption of new technologies, as large companies can make large technological investments (Agnew, 2016a; Kend and Nguyen, 2020; Oldhouser, 2016) and improve audit quality (Lugli and Bertacchini, 2022). In line with previous research (Agnew, 2016a; Kend and Nguyen, 2020; Oldhouser, 2016), some participants suggest that emerging technologies could represent an opportunity for the Big4 firms to widen the current gap, as these companies can invest many resources in the development of modern technologies, unlike smaller ones. Instead, some Italian auditors of non-Big4 firms believe that the current gap could be reduced slightly in the medium term as, for example, technologies become more affordable and user-friendly. Consequently, their application will allow smaller firms to offer the same services as Big4 companies and become as competitive as them. According to the respondents' opinions, the gap will likely remain, but rather than the capacity to process huge amounts of data, it will be based on the capacity to express timely, efficient, and effective professional judgements.

The above results should be considered taking into account the peculiarities of the Italian context regarding auditing firms and audit clients. The achieved conclusions are not easy to generalise to other settings due to certain peculiar characteristics of the Italian environment. Generally speaking, as Cameran (2005) argues, the Italian audit market is not directly comparable to either the Anglo-Saxon market or those of other major European countries on either the supply or demand side.[3] Nevertheless, the Italian setting is similar, from the institutional point of view, to those of several other European and non-European countries that are characterised by the presence of a large number of small auditors that perform their activities with basic technologies, as well as small and medium-sized firms that are unable to provide the auditor with data suitable for modern tools.

6. Conclusions

6.1. Summary

This article sought to analyse the impacts of new technologies, namely RPA and AI, on auditing firms. In particular, we focused on the everyday activities, organisational structure, hiring practices, and the competitive gap between Big4 and non-Big4 auditing firms. To achieve this aim, we developed a field study that involved 14 major Italian auditing firms.

The main results are as follows: First, auditors believe that new technologies will positively impact their everyday activities, as they will allow them to operate more efficiently and effectively. Process automation software will allow them to automatize repetitive and structured tasks, while intelligent system tools will support their subjective activities.

The main factor that the auditors highlighted is that small and medium-sized firms are unable to provide auditors with data suitable for modern tools (Dagilienė and Klovienė, 2019; De Santis and D'Onza, 2021). Thus, the auditors' reluctance to adopt advanced technologies may be due to the technological backwardness of the audit clients.

Second, concerning the organisational structure of auditing firms, the auditors' perceptions differ. Some respondents believe that modern tools will not affect the traditional hierarchical structure of auditing firms, while other participants hypothesise two scenarios. In particular, some auditors stated that the number of lower-level employees will reduce in the long term, as they perform tasks more prone to automation, while one auditor indicated that intermediate professionals may disappear in the future; in both cases, the pyramid-shaped structure could change. In other words, the first group of auditors believes that the pyramid structure of auditing firms will be turned upside down; the second group thinks that the pyramid will have an hourglass shape; the third group of auditors believes that the pyramid will survive, but its qualitative dimensions will change. In summary, the impact of new technologies on the organisational structure of auditing firms is unclear.

Third, emerging technologies will also affect auditors' skillset. Respondents consider IT expertise necessary for future auditors to master advanced tools, in addition to data analytics skills, which will also be in demand by auditing firms. However, the respondents believe that currently, auditors lack these skills, due to which some respondents foresee the hiring of new types of professional figures

[3] The supply side involves two types of statutory 'auditors' in Italy (i.e., Collegio Sindacale and full auditors). The demand side includes the segment of mandatory audit clients and that of voluntary audit clients (Cameran, 2005).

to respond better to technological innovation within auditing firms.

Finally, the analysis reveals different opinions regarding the impact of new technologies on the current gap between large and small firms. On the one hand, some professionals working in Big4 companies argue that the Big4 firms have more resources to invest in technology and competencies, which can widen the gap between them and smaller firms, as they will be able to access intelligent systems tools and leading-edge technologies. On the other hand, some participants in medium-sized enterprises agree that new technologies could represent an opportunity for smaller companies to slightly narrow the gap in the medium term, as process automation tools become available to both Big4 and non-Big4 firms. In addition, considering the opinions of the interviewees, it seems that the gap will probably remain but rather than the capacity to process huge amounts of data, it will be based on the capacity to make timely, efficient, and effective professional judgements.

To conclude, the results reveal that, although process automation tools and intelligent systems (i.e., RPA and AI) are not widely used and the auditors' views differ from one another, multiple changes are on the horizon. In this regard, one auditor claimed, '*using all these technologies is a fantasy for now, but just for now. I don't think we're too far away. I am quite sure that, even though I started this job 20 years ago, I think, for example, that I will see inventories carried out with the drone. I don't expect to retire and see no changes in that regard.*'

The main findings depicted above are summarized in Table 3.

6.2. Contributions

This study provides multiple contributions that can be used by both practitioners and academics. On the practical side, this research generates insights for auditing firms and universities. The advent of modern tools could influence several aspects of auditing companies, from their organisational structure to their hiring practices. Therefore, this study could be a starting point for such firms when reflecting on their strategies regarding the adoption of technologies and potentially rethinking some organisational aspects. Companies could, for example, decide to use modern tools instead of offshoring activities, as assumed by a partner at Auditing Firm 1, to obtain benefits (e.g., time savings) and avoid problems (e.g., coordination costs and delays in the process; Bellinga et al., 2022). Alternatively, to fill the skills gap, auditing companies could conduct training courses to enhance auditors' IT skills, as many professionals posited that these skills will be necessary to master the modern tools, but the current university programs do not provide auditors with these competencies. Furthermore, auditing firms prefer to train and grow employees internally instead of hiring them from technology companies (Fedyk et al., 2022). This study also provides insights to universities hoping to innovate their accounting curricula and thus allow students to acquire new skills in fields such as statistics, math, informatics, and programming to align with the competencies required by auditing firms.

Finally, this research contributes to enriching the literature related to the digitalisation of auditing firms, a largely unexplored topic. Indeed, as mentioned in the Introduction section, this work differs from previous studies as they mainly focus on factors such as audit quality, corporate governance, or external reporting. Thus, the value and originality of the paper are in the analysis of the effect of modern technologies on new perspectives (i.e., perspectives on the gap between large and small companies), as well as the organisational structure and recruitment practices of auditing firms. Moreover, this study focuses on Italian auditors' perceptions of RPA and AI and highlights issues that require further analysis. For instance, this work stresses the importance of the close link between the auditors' digitalisation and the audit clients' digitalisation. Thus, future research could explore this topic in more depth by analysing, for example, the opinions and perceptions of audit clients regarding auditors' digitalisation. It might also be interesting to explore the effects of technologies on the auditing industry using quantitative methodologies (e.g., see the work of Rahman and Ziru, 2022). Finally, even if this paper focuses on the use of modern technologies in the auditing of financial statements, it also offers insights regarding the use of modern tools in the assurance of non-financial reporting, which requires different procedures and data. The greenhouse gas emissions released and kWh of energy consumed by organisations are examples of information that should be verified.

Based on these considerations, future research could further develop the present work's key topics and broaden its boundaries by analysing the effect of modern technologies on audit firms from different perspectives (e.g., audit clients and universities) and, thus, provide a complement to our findings. Some future research questions that summarise the previous points are provided in Table 4.

Table 3
The impacts of RPA and AI on auditing firms.

	Process automation	Intelligent systems
Everyday activities	The general opinion is that process automation will automate routine and structured tasks.	The general opinion is that intelligent systems will support the auditors' subjective activities.
Big4/non-Big4 competitive gap	Over time, this type of technology will be adopted by Big4 and non-Big4 firms.	Big4's opinion: The current gap may increase as they will always use leading-edge technologies. Non-Big4's opinion: The gap may narrow slightly as technology becomes affordable for everyone over time.
Organisational structure	Some argue that the adoption of these tools may reduce the number of auditors devoted to routine and structured activities. Others believe these tools will change the competencies of the auditors but not their number.	Some argue that the adoption of these tools may reduce the number of auditors devoted to basic subjective activities. Others believe these tools will change the competencies of the auditors but not their number.
Hiring practices	Internet technology and data analytics skills should be acquired by future auditors.	

Table 4
Future streams of research.

Perspectives	Research question	Quotes from interviews
Auditing firms	1. Could emerging technologies represent an opportunity for smaller audit firms to increase their ***market share***? How has the market share held by small companies evolved? How will emerging technologies change the traditional ***pyramid structure*** of auditing firms? What are the actions implemented and planned by companies to fill the ***skills*** gap? Is there a relationship between an ***auditor's gender*** and technology adoption? What could be the impact of modern technologies on the assurance process for ***non-financial reporting***?	'*So, even if the Big4 firms will continue to have a large share of the market, new technologies are an opportunity to faintly reduce the gap. For example, if they currently hold 95 % of the market share, in the future, they will have 94 %*' (Partner, Auditing Firm 12). '*The classic pyramid can change, becoming more tapered and steeper as the people who carry out manual activities are replaced, at this time, by the staff present in the "Delivery Centres" and then, gradually, by machines*' (Partner, Auditing Firm 1). '*In 2020, these tools [Alteryx and Tableau] were introduced, which will gradually start on a series of selected jobs as tests [and] will then go to full capacity. It's a path that closes time. People must also be trained. For this reason, we are still attending training courses for the use of these tools*' (Manager, Auditing Firm 3).
Audit clients	1. What are the benefits and challenges perceived by ***audit clients*** regarding the digitalisation of auditors? Does the adoption of modern technology by auditing firms affect ***audit clients'*** choice of auditors? How do audit clients perceive the potential loss of interaction between auditors and ***audit clients***?	'*The customer does not perceive the added value. You offer a certain type of analysis to the client, but then, he doesn't give a damn*' (Manager, Auditing Firm 10).
Universities	1. Are current ***university*** accounting programs transforming? If not, are universities planning to update their degree programs? What are the main challenges that ***universities*** face in preparing their curricula (e.g., an increase in the cost of purchasing the most advanced technologies)? Have ***universities*** adopted new textbooks?	'*I foresee an addition of new figures to the staff rather than an expansion of the knowledge of economists, as the current university programs are not changing direction, so I expect that there will be new figures*'(Partner, Auditing Firm 11) .

6.3. Limitations

Despite its contributions, this study has some limitations. First, the results reflect the selected sample. Although the sample includes non-Big4 firms, it is centred on medium and large-sized auditing firms. However, this sample is acceptable, as, to date, smaller firms in auditing and in other industries tend to have a lower level of digitalisation. Second, it was not possible to apply the 'triangulation procedure' to all the interviews to validate all the collected data. Thus, there may be a professional bias in this study. Nevertheless, it was possible to confirm the internal and external consistency of the data, and thus, the risk of misunderstanding and bias is limited. Third, the selection of the interviewees was performed by relying on the auditing firms' administrative offices, which recommended the auditors with competencies and practical skills in the research field. Though we did not have the chance to verify the declaration by the auditing firms' administrative offices, the interviewees did not state anything that indicated otherwise. For example, the manager of Auditing Firm 3 claimed:

> *'In 2020, these tools [Alteryx and Tableau] were introduced, which will gradually start on a series of selected jobs as tests [and] will then go to full capacity. It's a path that closes time. People must also be trained. For this reason, we are still attending training courses for the use of these tools'*.

Furthermore, the interviewees were managers and partners (i.e., professional figures with high expertise; Bakarich and O'Brien, 2021) or directors of the company headquarters in Italy (e.g., the participant for Auditing Firm 9 is the data analytics director of Italy).

CRediT authorship contribution statement

Sonia VItali: Data curation, Writing-original draft, Investigation, Formal analysis, Methodology. **Marco Giuliani:** Conceptualization, Writing- review & editing, Validation, Supervision.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability

Data will be made available on request.

Appendix A. Interview questions

1. What are the emerging technologies (RPA and AI) being adopted?
2. What do the process automation technologies allow you to do?
3. What does the intelligent system allow you to do?
4. Do you analyze Big Data using advanced tools?
5. Has your firm made technology investments in RPA and AI?
6. Are there technology investments planned for the near future?
7. With the introduction of such technologies, could there be a reduction in the workforce?
8. How could the integration of human work and modern technologies occur?
9. Based on an analysis of the advantages and disadvantages of emerging technologies, could their introduction be the basis for creating and maintaining a new competitive advantage?
10. What professional figures will implement these technologies?
11. Might there be new professionals or positions within the company?
12. What are the skills that will be in demand in the future due to the adoption of new technologies?
13. Should the company's organisational structure be profoundly revised?

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