

Digital Technologies as an Enabler of Internal Audit Practices in the ESG Context: A Thematic Analysis of Recent Practices

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Abstract: The role of the internal audit function in the context of sustainability, as well as the impact of digital technologies on the transformation of the internal audit function, is receiving increasing attention in both professional and academic literature. However, it is not possible to draw clear conclusions about the involvement of internal audit in sustainability, nor about the contribution of digital technologies to the audit process in this context. All of the above indicates the need for systematic research that will contribute to a better understanding of internal audit practice and the possibilities for its greater involvement in the context of sustainability. The paper examines the role of internal audit function of the in ESG context and the contributions of digital technologies such as data analytics and artificial intelligence in strengthening internal audit for the analysis of ESG data and supporting its role in sustainability. The aim is to analyse how the application of these technologies can contribute to more effective internal audit activities in the context of sustainability. The paper employs a semi-structured literature review of scientific papers published between 2018 and 2026 in relevant scientific database. In addition, a thematic analysis is conducted in order to explore the research topic in greater detail. The paper contributes to the understanding of digital transformation in business by examining how digital technologies reshape internal audit practices and support ESG-related decision-making and governance processes.

Keywords: Internal Audit, ESG, Sustainability, Digital Technologies

1. Introduction

Sustainability has become a key element of modern business and sustainability reporting is gaining increasing significance. ESG brings together three dimensions (environmental, social, and governance) against which an organization's conduct can be evaluated as sustainable, responsible, and ethical (The Institute of Internal Auditors, 2021). Internal audit, a traditional ally of management and boards in providing assurance over internal controls and risk management, is becoming an indispensable partner in ensuring the reliability of sustainability information, both in the public and private sectors. In line with the expectations of professional internal audit associations, regarding the role of the internal audit function in ESG, internal auditors are considered able to engage through both types of core activities: assurance engagements and advisory activities. Advisory activities are more appropriate when a company is only just becoming subject to sustainability reporting requirements, whereas assurance engagements concerning the effectiveness of risk management, reporting and compliance will be more frequently present after the initial phase (ECIIE 2023). Such an approach confirms the need for internal audit to be systematically involved in the processes of sustainability, thereby contributing to the improvement of the overall corporate governance system, in line with its purpose and the public interest.

Internal audit is evolving from a compliance-oriented function into a proactive business partner in the sustainability and ESG transformation (de Leeuw and de Draaijer, 2025). There are evidences that indicate that role and activities of the internal audit function in ESG processes vary according to the multiple combinations of the companies ESG maturity level and the chief audit executive's perception of the internal audit function stakeholder's salience (Rakipi and D'Onza, 2024). The adoption of internal audit's expanded roles is strongly shaped by the influence of digital technologies, which enable greater efficiency and effectiveness of the function across all aspects of its work. According to practitioner perspective, internal audit increasingly uses data analytics for more effective collection and analysis of ESG information, thereby contributing to greater accuracy in assessing ESG risks and their effects (KPMG, 2023).

Although the role of internal audit in the area of sustainability and ESG is increasingly emphasised in professional guidelines and the position papers of relevant professional associations (The Institute of Internal Auditors 2021.; ECIIA 2023.), the academic literature on this topic is still developing, and empirical insights into the actual practice and impact of the internal audit function remain limited (Hazaea et al. 2022). Recent systematic literature reviews analyse internal audit practices in ESG (Vo Van, Abu Afifa and Bui Van 2026; Sheta, Osman and Elamer 2025), but without focusing on the use of digital technologies in this context. This reveals that research has largely addressed what internal audit does in ESG, while how digital tools can strengthen that role remains underexplored. This paper focuses on the role of internal audit in the ESG context and the contribution of digital

technologies to that role, aiming to analyse how the application of these technologies can contribute to more effective internal audit activities in the context of sustainability. Based on those objectives, the following research questions were identified:

RQ1: What are the responsibilities and roles of the internal audit function in the ESG context, and what obstacles prevent it from maximising its role in ESG processes?

RQ2: How can digital technologies such as data analytics (DA) and artificial intelligence (AI) benefit the internal audit process in ESG-related engagements?

The remainder of the paper presents the methodology and the results of the research on recent literature regarding the roles of internal audit in ESG as well the benefits of using digital technologies in this context, and the conclusions of the research

2. Methodology

This paper employs a semi-structured literature review based on Snyder (2019), and this approach was chosen because the aim is to map how internal audit's role in ESG is addressed in the literature and to identify the research gap concerning the use of digital technologies. The review process involved scoping of the research, identification of search terms, identification of data sources and paper collection, paper filtering, and content evaluation and synthesis, broadly following the steps outlined in Amani and Fadlalla (2017) and Khlif and Chalmers (2015). In addition, thematic analysis was applied following Braun and Clarke (2006). Coded segments were grouped into predefined themes describing the role of internal audit in the ESG context and the benefits of using digital technologies for the internal audit process in that context.

To investigate the activities of internal audit in the ESG context, as well as the contribution of digital technologies (data analytics and artificial intelligence), a search of Web of Science indexed papers was conducted for the period from 2018 to 2026. The year 2018 was chosen as the starting point as it marks the beginning of the application period of the Directive 2014/95/EU, known as the Non-Financial Reporting Directive (NFRD). Search terms combined three concept groups: internal audit, ESG/sustainability, and digital technologies (data analytics, AI, machine learning, RPA, etc.), using Boolean operators. Two search strings were used, both combining internal audit terms with ESG-related terms (485 papers identified) and digital technology terms (84 papers identified). After an initial screening of titles and abstracts, 75 papers (sample includes studies using both qualitative and quantitative methodologies, as well as mixed-methods and conceptual/review) papers relevant to the topic were included. Following a thorough reading of all papers, 42 papers were retained for final analysis, while the remainder did not match the research focus.

After the final definition of the papers that were taken into consideration, further investigation was conducted following Braun and Clarke's (2006) six-step analysis approach. In order to achieve the research objectives, the authors started with a predominantly deductive approach, searching for predefined themes which included the following: the activities of internal audit in the ESG context, the challenges that internal audit faces regarding involvement in ESG processes, and the benefits of using digital technologies by internal audit in the ESG context. In addition, given that it was expected that the analysis would not include a large number of papers simultaneously analysing the aforementioned themes, two new themes were included in the analysis, the benefits of applying data analytics and artificial intelligence in internal audit. The analysis was therefore extended to papers that discuss the use of these technologies in internal audit even when they do not describe internal audit activities within the ESG process, so that these benefits could be placed in the context of the contribution of internal audit activities to ESG processes. As the analysis continued, the predefined themes were refined to capture the codes more precisely and to prevent overlap between them. Finally, the themes were used to address the research questions concerning the activities of internal audit in the ESG context and the ways in which the use of digital technologies can enhance the work of internal auditors and strengthen the significance of their role in this context. The software MAXQDA Analytics Pro was used to code and track codes within the identified themes more systematically.

3. Analysis of Recent Literature Regarding the Role of Internal Audit in ESG and Benefits of Using Digital Technologies in This Context

According to the results presented in Table 1, of the 42 analysed papers, 74% address the role and activities of internal audit in ESG, while only 10% link that role to a specific technology (data analytics, AI). This imbalance

suggests that the field is at an early stage of development and the benefits of using digital technologies for internal audit in ESG context have yet to be explored.

Table 1: Frequency of themes across the analysed papers¹

Themes	Number of analysed papers	% of sample (n=42)
Challenges of involving IA in ESG	11	26%
Benefits of using AI in internal audit process	4	10%
Benefits of using DA in internal audit process	8	19%
Use of digital technologies in IA process in ESG	4	10%
Internal audit role in ESG	31	74%

Source: Compiled by the authors

The research results relate to a total of 22 different countries (Australia, Brazil, China, Egypt, Germany, Austria, Switzerland, Ghana, Nigeria, Indonesia, Italy, Jordan, Libya, Malaysia, Pakistan, Portugal, Romania, Saudi Arabia, South Africa, Turkey, USA, Vietnam), although some studies were conducted at a global level or across several European countries.

Theme *Role of internal audit function in ESG* addresses activities performed by internal auditors within assurance and consulting engagements, as well as the overall contribution of the internal audit function to ESG processes. According to analysed papers, a greater prevalence of assurance engagement activities can be identified, that is, activities that form part of that type of engagement. Accordingly, within the ESG context internal audit provides assessment the effectiveness of internal controls regarding sustainability processes (Alsaied and Alyousef 2026; De Simone et al., 2021; Kolsi and Al-Hiyari, 2024; Puci and Guxholli, 2018; Rakipi and, 2024) of companies from various sectors such as manufacturing (Amoako et al., 2023). In addition to the above, internal audit provides evaluation of implementation and effectiveness of company ESG policies (Alsaied and Alyousef 2026), evaluating company's ESG related activities such as use of alternative materials or energy reduction, assess effectiveness of company's green policies and analyse violations (Van, Abu Afifa, and Bui, 2025) and performs oversight and review related to environmental performance and emissions Hashed et al. 2025).

Internal audit activities in risk management related to sustainability are also prominent part of its assurance role in the ESG context. In this regard internal audit is actively engaged in evaluating governance and risk management processes (Engelbrecht et al. 2018; Kolsi and Al-Hiyari 2024; Lampropoulos et al. 2025; Olteanu Burca and Badea Florea 2024;) as well as the adequacy of formulated ESG objectives (Engelbrecht et al. 2018). Internal audit assesses the robustness of risk management processes related to climate risk (Alsaied and Alyousef, 2026), creating maps of company's sustainability risks (Aureli et al. 2020), enabling companies to proactively manage sustainability-related risks and embed sustainability objectives within their strategic and operational activities (Bezverkhyi et al. 2025). Internal audit function is also actively identifying emerging sustainability risks (Liu et al. 2025), such as risks regarding environmental and social issues (Van, Abu Afifa and Bui, (2025), risk factors (Sheta, Osman and Elamer 2025) and monitors risks (Puci and Guxholli 2018).

Internal audit also reviews ESG reporting practices, as well as alignment of sustainability objectives with strategy (Puci and Guxholli 2018), providing measurement over ESG goals (Rakipi and D'Onza 2024; Van, Afifa, Van 2026) and assessing accuracy of data for ESG reporting (Al-Qadasi (2024). Given how sustainability reporting reliability is affected by data accuracy, it is interesting to note that internal audit also participates in defining procedures regarding the collection of ESG data, both qualitative and quantitative (Aureli et al. 2020), also has a key role in enhancing transparency of ESG reporting (Maleki Vishkaei et al. 2025; Bonsu et al. 2025; Gherai et al. 2024; Hazaea et al. 2022) and reliability of sustainability data (Bezverkhyi et al. 2025) as well as its accuracy (Amoako et al. 2023; Alsaied and Alyousef 2026; Mihaylova and Blumer 2025). Internal audit bridges operational data and corporate-level ESG assurance within complex governance structures (Yildirim 2026).

Considering that sustainability/ESG practices are highly regulated, it is not surprising that activities related to conducting compliance audits are also part of the internal audit activities identified within this theme. Within assurance engagements, internal audit also reviews compliance with regulations or proposed framework (Amoako et al. 2023; Alsaied and Alyousef 2026; Soh and Martinov-Bennie 2018; Sheta, Osman and Elamer 2025)

¹ Note: Percentages exceed 100% in total because papers could be coded under multiple themes.

such as those of human rights and environmental issues (Rakipi and D'Onza 2024), labor policies and labour regulation (Van, Abu Afifa, and Bui, 2025) or environmental regulation (Wehrhahn 2025).

Regarding advisory engagements, internal auditors are engaged in educating management on sustainability reporting regulation and compliance (Liu et al. 2020), providing advisory recommendations for performance improvement (Puci and Guxholli, 2018) and advising improving ESG practices (Van, Afifa, Van 2026) as support (Ferreira et al. 2024). Activities such as assisting management in risk assessment, control design and KPIs regarding ESG (Rakipi and D'Onza 2024) were also identified, as well as evaluating KPI regarding ESG goals (Purnamasari and Umiyati 2024; Rakipi and D'Onza 2024). It also performs due diligence on sustainability issues (Puci and Guxholli 2018) such as supply chain (Rakipi and D'Onza 2024). Internal auditors are identified as facilitators for managers in the process of creating materiality matrix, being active support in ESG processes instead of the pursuing the role of inspector (Aureli et al. 2020; Ridley and Gulko 2025). Overall "internal audits can be a leader, a driver that stimulates the creation, development and assurance of ESG strategies" (Kolsi and Al-Hiyari 2024, p.1444). Despite this, it is also found that internal audit contributes to ESG and sustainability reporting, but its assurance and advisory role in this area remains limited and rare (Engelbrecht et al. 2018; Gherai et al. 2024).

Based on the analysis of the predefined theme *Role of internal audit function in ESG*, it can be concluded that the internal audit function within the ESG context is undergoing a transformation: from its initial appearance as a compliance-oriented "key implementing actor of sustainability culture" (Aureli et al. 2020, p.2400) it develops into a "strategic governance mechanism" (Alsaid 2026, p.36), with an emphasis on providing assurance through the management of ESG risks and internal controls.

Regarding the attributes of theme *Challenges of internal audit inclusion in ESG processes* that refers to obstacles that prevent the internal audit function from maximising its role in ESG processes we identified several ones. Most often mentioned is the need for specialized skills or lack of competence (Engelbrecht et al. 2018); Rakipi and D'Onza 2024; Sheta et al. 2026; Sheta, Osman and Elamer 2025; Wehrhahn 2025) which often causes less inclusion of internal within ESG context due to negative perception of internal audit capacity among stakeholders (Simpson et al. 2021). Lack of internal resources is also one of the identified challenges (Masoud 2025; Liu et al. 2020), frequently associated with lack of financial resources that causes limited investment in skills development (Van, Afifa, Van 2026) and specialized educational programs (Engelbrecht et al. 2018). Absence of methodology for assurance (Sheta, Osman and Elamer 2025; Engelbrecht et al. 2018) also present a challenge for internal audit in order to provide greater value in ESG context as well as conflict of internal audit roles (ESG assurance vs consulting) (Sheta, Osman and Elamer 2025). Limited financial capacity to invest in digital tool (Sheta, Osman and Elamer 2025) may be regarded as a cause of "Environmental, Social, and Governance (ESG) Helplessness Syndrome in internal auditing" in which risk is recognised but the operational tools to address it are missing (Yildirim 2026, p.4356).

Concerning the attributes of the theme *Benefits of using digital technologies in the internal audit process in ESG-related engagements*, which refers to the practical benefits of using digital technologies across all phases of the internal audit process in ESG-related engagements, it is important to note that this is the theme analysed in the smallest number of papers, and in some of them it is only mentioned indirectly, through the analysis of other authors' research. The analysed papers mention using digital technologies predominantly for risk identification such as using Chat GPT for identification of ESG risks and to support the application of regulatory requirements (Eulerich and Wood 2025) or AI-driven sustainability risk models (Sheta, Osman and Elamer (2025). In their review, Masoud (2025) point to emerging technologies (AI, blockchain and big data analytics) being linked to ESG-related auditing, drawing on earlier studies for tracking ESG metrics. Similarly, Purnamasari and Umiyati (2024) note that emerging digital technologies such as big data analytics help detect and verify mismatches between actual and reported ESG performance.

In order to identify the possible benefits of applying digital technologies (DA and AI) in internal audit within the ESG context, papers addressing their use in internal audit outside the ESG context were also analysed, in order to identify benefits that could also be applied to this area of internal audit responsibility. The above refers to the attributes of the themes *Benefits of using DA in the internal audit process* and *Benefits of using AI in the internal audit process*, both concerning the practical benefits of these technologies in the internal audit process.

The analysed papers identified numerous benefits of applying DA in the internal audit process, which can be applied across all phases of the internal audit process (Betti et al. 2024), from planning to follow – up. In general, there is broad agreement that these benefits increase the efficiency and effectiveness of internal audit activities (Betti et al. 2021; Wagener et al. 2023; Salman Almahuzi 2026; Andrade, Penha and Silva 2021) and audit quality

(Wagener et al. 2025). Through descriptive analytics, internal auditors can examine past trends and patterns that point to potential irregularities; diagnostic analytics then helps uncover why current problems arise, for instance weak internal controls or policies (Salman Almahuzi 2026). DA enables integration of diverse sets of data from various sources which allows internal auditors more comprehensive view of organizational risks (Salman Almahuzi 2026) and enables risk identification and prediction (Salman Almahuzi 2026; Betti et al. 2024). DA also enables fraud detection (Alvarez-Foronda 2023; Betti et al. 2024) since DA tools enable internal auditors population testing (Betti et al. 2024; Alvarez-Foronda 2023) and better value extraction from big data (Rakipi et al. 2021). All of the aforementioned increases the value of audit findings for stakeholders (Betti et al. 2021; Wagener et al. (2025), enables better visual presentation of audit findings (Alvarez-Foronda 2023) and increases the perceived internal auditors' competence and capability (Betti et al. 2024; Wagener et al. 2025).

The analysis of papers concerning the benefits of applying AI also shows that the use of AI tools in internal audit increases the efficiency and effectiveness of internal auditors' work (Alassuli 2025; Salman Almahuzi, 2026; Wassie and Lakatos 2024). The use of AI tools enables internal auditors testing population of large data amounts and large data sets (Alassuli 2025; Salman Almahuzi 2026), risk identification and more efficient risk-based audit planning (Alassuli 2025; Eulerich and Wood 2025), as well as more efficient detection of frauds and anomalies (Salman Almahuzi 2026). Alongside the above AI tools can help in preparing questions for interviewing, draft findings, generate well-structured reports and track implementation of recommendations (Alassuli 2025; Eulerich and Wood 2025) which suggests that the benefits of their application are reflected across all phases of the internal audit process, as is the case with the application of DA tools.

4. Conclusion

Based on the analysis, it can be concluded that a substantial research gap exists regarding the application of digital tools in internal audit within ESG processes. According to the findings, internal audit is engaged in ESG processes mainly with its assurance role but also through advisory activities. Notably, only a small fraction of the analysed papers connects this role to specific digital tools, revealing that the technological dimension of internal audit's ESG work is still largely unexplored. Some findings suggest that this role remains limited in certain cases, and several challenges that hinder the maximisation of internal audit's value in the ESG context were also analysed. In this respect, a notable finding concerning challenges is that, alongside a lack of competencies, stakeholders tend to have a poor perception of internal auditors' capabilities. The use of digital technologies could help overcome this challenge, given that, according to the findings, their use in internal audit outside the ESG/sustainability context significantly increases the efficiency and effectiveness of internal auditors' work. DA and AI-based tools can assist internal auditors in identifying risks and analysing large volumes of data from various internal and external sources, which is a big concern in the ESG context.

Given the identified research gap, future research could focus on the benefits of applying digital tools in internal audit within the ESG context. Concrete findings would promote their wider use, demonstrate their value to internal audit stakeholders, and thereby help address some of the identified challenges, such as the financial investment required for digital tools. A limitation of this study stems from the analysis of papers from a single database and the size of the sample, as well as the reliance on the authors' judgement in coding, although coding was carried out jointly by the authors to improve consistency.

Ethics Declaration

Ethical clearance was not required for the research.

AI Declaration

AI tools were not used for the creation of the paper's content.

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