The Accounting Journal of BINANIAGA Vol. 09, No. 01, June 2024
p-ISSN: 2527-4309, e-ISSN: 2580-1481
5th Accreditation Rating: January 14, 2019 - January 13,2024

Research.

Accounting, Artificial Intelligence (AI), Environmental Social & Governance (ESG): An Integrative Viewpoint

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Received: May 8, 2024 Accepted: June 6, 2024 Published: June 30, 2024

To cite this article**: Silitonga, RM., Putra, VP., Sukwadi, R., & Jou,Y-T**. (2024). Accounting, Artificial Intelligence (AI), Environmental Social and Governance (ESG): An Integrative Viewpoint. *The Accounting Journal of BINANIAGA,* 9(1), 39-50. doi: 10.33062/ajb.v9i01.47

Abstract*. Artificial intelligence (AI) is present in every facet of contemporary life, and concerns about sustainability are receiving more attention across the board in human endeavors. Nowadays, large firms are expected to report on their operations, expose them, and account for their environmental and social footprint. This is accomplished through various frameworks, measurements, and also environmental, social, & governance standards, or ESG (Environment, Social Governance), gradually replacing the more traditional term CSR (Corporate Social Responsibility). Accountants should use AI techniques to assess and validate an organization's sustainability and net-zero commitment claims. In this manner, accountants may guarantee AI technology's moral and efficient integration into accounting procedures by validating an organization's ESG metrics and enacting change from the inside. The methodology adopted for this study includes qualitative data collection, which primarily revolved around interviews using purposive sampling. Professionals must effectively utilize AI's potential in sustainable accounting. For future research, it is crucial to develop an entire framework based on the principles described here, based on various sources that describe the integration between accounting, AI, and ESG.*

Keywords: accounting, artificial intelligence, ESG

INTRODUCTION

Every aspect of modern life involves Artificial Intelligence (AI), and sustainability issues are becoming increasingly important in all human undertakings (Makridakis, 2017). Large companies are now expected to disclose, account for, and report on their environmental and social footprints. Sustainability, which seeks to establish a peaceful coexistence between humans and the natural world, is based on ESG problems (Wan and Dawod, 2022).The acronym ESG (Environment, Social Governance), which is rapidly replacing the more conventional term CSR (Corporate Social Responsibility), is used to do this through a variety of frameworks, metrics, and standards for environmental, social, and governance (Verbin, 2020).

Artificial Intelligence (AI) is being used in many different corporate operations, such as human resource management, research and development, production, distribution, procurement, sales and marketing, accounting and finance, and audit. Since accounting and auditing are essential components of company operations, they are also subject to the benefits and drawbacks of artificial intelligence. Accounting and tax

professionals can work more efficiently and obtain a competitive advantage by staying current with the newest developments in AI, a constantly changing field. The current work practices of accountants and tax experts are being altered by AI. Thanks to the quick advancements in AI, accounting companies can now expedite routine tasks, analyze enormous amounts of financial data, spot trends, and anomalies, reduce human error, and stay current with constantly changing laws and regulations more efficiently than before.

Nevertheless, the ethical issues that are brought up by this revolutionary technology call for cautious thought and appropriate application. Recent research from the Association of Chartered Certified Accountants (ACCA) and Chartered Accountants Australia and New Zealand (CA ANZ) strengthens the role of accountants in advancing ethical AI (ACCA, 2021). According to this paper, the accounting profession, guided by five fundamental principles—integrity, impartiality, professional competence, due care, confidentiality, and professional behavior—is intrinsically associated with Environmental, Sustainability, & Government (ESG) considerations. Moreover, this congruence is essential, not coincidental, given that 65% of finance professionals surveyed think their leaders prioritize ethics as highly as profits.

The primary inquiry of this study focuses on the role of accountants in advancing environmental sustainability through the utilization of AI. Until now, there hasn't been a comprehensive examination of how practitioners view the intersection of accounting, AI, and ESG initiatives. This research aims to fill this gap by delving into the nuanced ways accountants engage with AI technologies to address environmental concerns within the realm of corporate responsibility. By exploring these perspectives, the study seeks to offer valuable insights into how the accounting profession can effectively contribute to sustainability efforts in the age of artificial intelligence.

Research Problem

The main research question for this study is to understand how accountants contribute to environmental sustainability by leveraging Artificial Intelligence from a practitioner viewpoint with various sub-research questions, including:

1. What are the benefits of AI implementation in accounting and ESG?
2. What are the challenges associated with integrating accounting, AI, and ESG?

LITERATURE REVIEW

Sustainable Development Goals (SDGs)

It may seem that the idea of sustainability is both natural and relatively simple. The United Nations (UN) commission, led by Gro Harlem Brundtland, released the 1987 report Our Common Future, typically cited as the source of sustainability and the concept of sustainable development. Sustainability in commercials, politics, and the SDGs are becoming increasingly connected. In the document Transforming our World: The 2030 Agenda for Sustainable Development (United Nations, 2015), the United Nations (UN) outlined these objectives. The 17 Sustainable Development Goals (SDGs) were established by the UN, and indicators are included in each SDG to track the goals' advancement. Every goal tackle issue related to the environment, society, and economy (Elder and Olsen, 2019). The 17 objectives in Figure 1 make up the framework.

Figure 1. The Sustainable Development Goals (United Nations, 2015).

Environmental, Sustainability, & Government (ESG)

The previous few decades have seen a progressive increase in interest in environmental growth and methodology, with citations to the global community, corporate social responsibility, and performance (ESG) (Gao et al., 2022). The awareness of corporate social responsibility is the foundation of the ESG concept. According to the publication "Who Cares Wins," the United Nations originally used the term ESG in 2004. The United Nations completed the Principles for Responsible Investment in 2006, enabling investors to consider social, environmental, and corporate governance factors when making investment decisions. The definition of ESG was created by Martha and Khomsiyah (2023) and was based on the integrated environment of Goldman Sachs, socially responsible considerations, and governance aspects that investors found most concerning.

Figure 2. ESG through the lens of SDG (Berenberg, 2018)

Issues of privilege, social justice, and how businesses affect society, and the environment are more important than ever in today's world. Environmental problems include a variety of topics, including biodiversity and climate change. It is now widely acknowledged that one of humanity's biggest challenges is loss, pollution, etc. When addressing the SDGs, many people concentrate on the three pillars of sustainability—society, economy, and environment (United Nations, 2015; Vinuesa *et al.,* 2020). However, this article focuses exclusively on assessing and disclosing AI impacts, and it can be helpful to match the SDGs with the three ESG components in this context. A figure based on Berenberg's (2018) work is shown in Figure 2.

Demands for reporting and disclosure vary according to the kind of business and the location; currently, the most common word used about disclosure requirements is ESG (Etsy *et al.,* 2020). While the financial sector has the most established formal standards, it is evident that stakeholders of all stripes want information about the risks and sustainability impact of corporate operations. Attempts to simplify and make the disclosure of such data comparable, universal, and readily available are becoming increasingly important for all kinds of businesses. Although the SDGs were not originally designed to serve as an ESG reporting framework, their usage is growing (Bose, 2020). The fundamental tenet of employing the SDGs in this way is that they emphasize the ability of corporations and investors to bring about change.

Artificial Intelligence (AI)

Artificial Intelligence (AI) is the term used to describe a system or machine that simulates human intellect. The aim of AI is to create a machine that is capable of human-like perception, reasoning, learning, planning, prediction, and other human-like activities. One of the primary traits that sets humans apart from other animals is intelligence. The constant occurrence of industrial revolutions has led to the displacement of human labor in all spheres of life by an expanding number of machine kinds; the next major obstacle to be addressed is the impending replacement of human resources by machine intelligence. The fact that so many scientists are concentrating on AI means that the field's research is vast and varied. Search algorithms, knowledge graphs, natural language processing, expert systems, evolution algorithms, machine learning (ML), deep learning (DL), and other areas are among the research fields in AI. Perceptual, cognitive, and decision-making intelligence are all involved in the evolution of artificial intelligence. When a machine possesses perceptual intelligence, it indicates that it has the same basic senses as people, such as vision, hearing, touch, etc. A higher level of induction, reasoning, and knowledge acquisition is known as cognitive intelligence. It is motivated by brain-like intelligence, cognitive science, and brain science to give machines human-like reasoning and cognitive capacities. When a machine possesses sensory and cognitive abilities, it is frequently expected to make the best decisions, much like humans, to enhance industrial manufacturing, people's lives, etc. To make the best decisions possible, decision intelligence has to broaden data science through the application of applied data science, social science, decision theory, and managerial science. Perceptual, cognitive, and decision-making intelligence are the end goals that must be attained by the infrastructural layer of AI needs to be backed by data, processing power, storage, ML algorithms, and AI frameworks. It may then study the internal laws of data to support and realize AI applications by training models. With a significant impact on our work and way of life, artificial intelligence is finding broader and deeper applications in the fields of fundamental sciences, industrial manufacturing, human life, social governance, and cyberspace (Xu *et al.,* 2021).

Artificial Intelligence Ethic

AI does, however, also provide a number of serious ethical dangers or problems for users, developers, people in general, and society as a whole. In the last few years, numerous instances of AI leading to subpar results have been noted. The study of AI ethics, often known as machine ethics (Allen *et al.,* 2006), is a new, multidisciplinary

discipline that focuses on moral questions related to artificial intelligence (Anderson & Anderson, 2007). AI ethics encompasses the study of ethical theories, guidelines, policies, principles, laws, and regulations pertaining to AI, as well as ethical AI, or AI that can adhere to moral standards and acting morally (Siau & Wang, 2020). Building ethical AI or getting AI to act ethically requires an understanding of AI ethics. It has to do with the moral or ethical standards and values that establish what is ethically acceptable and unacceptable. With the right AI ethics, ethical AI can be developed or applied using specific techniques and tools.

The report from ACCA (2021) makes a compelling case for incorporating ESG factors and AI ethics into a coherent organizational strategy. Accountants must take the lead at this nexus of AI, ethics, and sustainability since they are held to these standards. For example, the ACCA expressly demands that accountants aggressively counteract greenwashing. They should use AI techniques to assess and validate an organization's sustainability and net-zero commitment claims. In this manner, accountants may guarantee AI technology's moral and efficient integration into accounting procedures by validating an organization's ESG metrics and enacting change from the inside.

RESEARCH METHODOLOGY

The methodology adopted for this study includes qualitative data collection, which primarily revolved around interviews using purposive sampling (Charmaz & Belgrave, 2007). The study's participants included senior managers from the manufacturing, services, small and medium sized business (SMEs), and extensive enterprise (LE) sectors who had experience with accounting, AI, and ESG. In this study, purposeful sampling was employed. By applying judgment, a researcher can employ purposeful sampling to choose individuals, situations, organizations, events, etc., allowing them to examine a sample's unique qualities (Tonjang & Thawesaengskulthai, 2020). An exploratory qualitative design was used in the study to get the senior manager's opinions on the real-world application of accounting, AI, and ESG. In addition, experts were selected to provide contrasting perspectives on the integration of accounting, AI, and ESG. Since senior managers with more than five years of experience are directly involved in developing accounting, AI, and ESG strategies within their organizations and making decisions, the information gathered from them will be more accurate. Potential participants received a personalized email explaining the purpose of the study and asking for their voluntary involvement. After consenting to the interview, one was held virtually over Zoom or Microsoft Teams.

The interviews started with demographic questions about the participant's experience working within accounting, AI, and ESG, followed by three open-ended ones. By asking every respondent the same questions, it was ensured that the qualitative study would be more consistent and comparable. The focus of the questions was centered around motivation factors for adopting AI and its impacts on accounting and ESG, benefits from the implementation of accounting, AI, and ESG integration, and the role of leadership in the successful adoption and implementation of accounting, AI, and ESG integration. Open-ended, more analytical questions were subsequently asked concerning accounting, AI, and ESG regarding various facets of information expressed by the respondents during the study. provement. The analysis plan is diagrammatically depicted in Figure 3 to help the readers to understand the analysis.

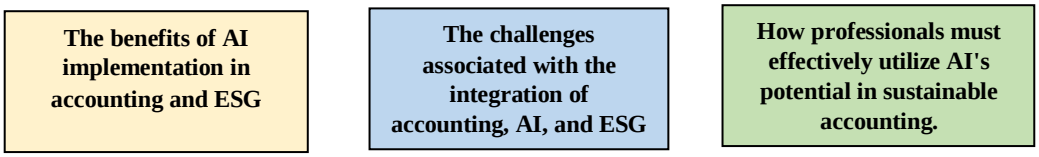

Figure 3. Analysis plan of the study

RESULTS AND DISCUSSION

Machine learning and generative AI advancements are revolutionary for the tax and accounting industry. ESG aspects are difficult to measure in real-time in standard accounting. They mostly rely on in-person analysis, intricate computations, and recurring audits. AI's entry into this environment drastically alters the nature of the game. Artificial intelligence (AI) technologies provide sophisticated data analytics capabilities that may continuously evaluate several ESG metrics across different operational aspects of an organization.

The speed and accuracy of data analysis significantly enhance when AI algorithms are trained to focus on sustainability criteria, such as waste management, social responsibility, and carbon footprint. Accountants can, therefore, expedite the adoption of sustainable practices inside their organizations by using these AI-generated insights to make more informed decisions. Crucially, this guarantees real-time accountability by enabling prompt remedial action when a company deviates from its sustainability targets.

Furthermore, the adaptability of AI-powered solutions enables customization according to sector-specific requirements. The speed and accuracy of data analysis significantly enhance when AI algorithms are trained to focus on sustainability criteria, such as waste management, social responsibility, and carbon footprint. Accountants can then expedite sustainable practices using these AI-generated insights to make more informed judgments.

AI can analyze several data sources and produce accurate and fast metrics that accountants may use to make well-informed decisions. However, professionals must effectively utilize AI's potential in sustainable accounting. Using ACCA as inspiration, here is how:

1. **Establish leadership in adopting AI:** Establishing leadership in AI adoption is essential to the success of an organization. Senior leadership should be the driving force behind integrating AI since they set the standard for ethical behavior and sustainable operations within the organization. Senior executives can support AI integration by embracing its usage in accounting operations and exhibiting a commitment to ethical AI practices, according to a study by Siau & Wang (2020). Organizations can encourage a culture of AI adoption at all company levels by addressing concerns and adopting clear internal standards.
2. **Strategic delivery and oversight:** Ensuring that AI technologies are in line with company goals and ethical standards requires strategic delivery and oversight. The accounting department is essential in overseeing the procurement, deployment, and continuous observation of these technologies, working closely with the IT and compliance departments. According to research by Allen *et al.* (2006), to reduce risks and guarantee alignment with business goals, cross-functional collaboration is crucial for supervising AI implementation.
3. **Give data management top priority:** Prioritize data management above all else to optimize the performance of AI applications. The precision and applicability of the data flow have a major impact on the caliber of AI-driven results. As to Anderson & Anderson (2007) findings, giving priority to efficient data management guarantees that algorithms retrieve accurate and relevant data, resulting in more consistent outcomes.
4. **Recognize the vendor landscape:** Understanding the capabilities and limitations of AI technology suppliers can help accountants choose the best solutions for their Environmental, Social, and Governance (ESG) tracking needs. This is consistent with recent research by Siau and Wang (2020), which

emphasizes how crucial it is to comprehend the capabilities and limitations of AI technology suppliers when choosing suitable solutions for ESG tracking.

5. **Develop relevant skills:** Accountants need to stay up to date on the latest developments in artificial intelligence and the changing corporate environment. This means keeping one's financial savvy in addition to comprehending the ethical ramifications of emerging technologies. According to Anderson & Anderson (2007), in order for accountants to successfully traverse the intricacies of the contemporary business environment, they must be up to date on developing technologies and the ethical implications associated with them.
6. **Use professional judgment:** AI generates data, but human judgment turns it into knowledge that can be used. This is where accountants' experience shines through: by applying their knowledge, they can evaluate AI's outputs and make sure they correspond with both moral and financial goals. This claim is consistent with research by Allen *et al.* (2006), who highlight the vital role that human judgment plays in directing AI systems toward moral and practical objectives.
7. **Fight Greenwashing:** As mentioned before, one of the main duties of accountants is to confirm the sustainability claims that businesses make. Although AI systems are quite good at quickly spotting differences, accountants need to be careful when examining claims that can be untrue or deceptive. The study by Siau and Wang (2020), which highlights the significance of human oversight in assessing the credibility of sustainability claims, especially in the context of AI-driven assessments, emphasizes this cautious approach.
8. **Engage stakeholders:** Keeping lines of communication open with stakeholders, both internal and external, fosters trust and guarantees openness. By employing AI-generated insights, accountants may enhance the accessibility and comprehensibility of Environmental, Social, and Governance (ESG) measures, hence facilitating informed decision-making. Research by Anderson and Anderson (2007), which emphasizes the function of AI in improving data accessibility and encouraging transparency in decision-making processes, lends credence to this strategy.
9. **Create sustainable value:** To monitor their clients' financial performance and create long-term value, accountants are essential. They can better balance sustainability and profitability with AI's help, making this dual function more attainable. Research by Siau and Wang (2020), which emphasizes AI's ability to improve decision-making processes and maximize results in pursuit of both sustainability and profitability goals, lends credence to this claim.

Integrating artificial intelligence (AI) into accounting and Environmental, Social, and Governance (ESG) practices brings numerous advantages. AI automates repetitive tasks in accounting, such as data entry and reconciliation, leading to time savings and increased productivity. In ESG, AI streamlines data collection and analysis, reducing manual effort and enabling more comprehensive reporting. AI algorithms can identify errors and anomalies in financial data, enhancing the accuracy of financial reporting. Similarly, in ESG reporting, AI ensures data integrity by standardizing and validating ESG metrics, resulting in more reliable sustainability disclosures. AI techniques like machine learning enable deeper financial and ESG data analysis, uncovering insights that may not be apparent through traditional methods. This allows organizations to identify trends, risks, and opportunities more effectively. AI models can assess financial risks in real time, detect fraudulent activities, and predict future risks based on historical data patterns. In ESG, AI identifies and evaluates environmental and social risks, helping companies mitigate potential impacts on their reputation and operations. AI ensures compliance with accounting standards and regulatory requirements by automating compliance checks and

generating accurate financial reports. Similarly, in ESG reporting, AI assists in aligning with evolving ESG disclosure frameworks and meeting regulatory obligations. AI-driven insights support strategic decision-making by providing timely and relevant information on financial performance, risks, and ESG metrics. This enables organizations to make informed decisions that align with their long-term goals and sustainability objectives. AI-powered reporting tools enhance transparency by providing stakeholders access to comprehensive and understandable financial and ESG information. This fosters trust among investors, customers, employees, and other stakeholders, strengthening relationships and improving reputation. Organizations that leverage AI in accounting and ESG practices gain a competitive edge by improving operational efficiency, risk management, and decision-making capabilities. Additionally, demonstrating a commitment to ESG through AI-driven sustainability initiatives can attract socially responsible investors and customers, enhancing the organization's market position. Overall, the benefits of AI implementation in accounting and ESG practices extend beyond operational efficiency to encompass improved accuracy, risk management, compliance, decision-making, stakeholder engagement, and competitive advantage.

Integrating accounting, artificial intelligence (AI), and environmental, social, and governance (ESG) considerations poses several challenges and opportunities for improving corporate sustainability and accountability. There are some of the critical challenges associated with this integration. ESG data is often qualitative and unstructured, making it challenging to incorporate into traditional accounting systems. Ensuring the quality and availability of ESG data for AI-driven analysis is crucial for accurate decision-making. ESG factors are complex and interconnected, making it challenging to capture their full impact on financial performance using traditional accounting methods. AI can help analyze large datasets and identify non-linear relationships between ESG metrics and financial outcomes, but interpreting these relationships accurately can be challenging. There is a lack of standardization in ESG reporting frameworks, which makes it challenging to compare ESG performance across companies and industries. AI can help identify relevant ESG metrics and benchmarks, but standardization efforts are needed to ensure consistency and comparability. Regulatory requirements related to ESG reporting vary across jurisdictions and are subject to change. Companies must stay abreast of evolving regulatory requirements and ensure compliance when integrating ESG considerations into their accounting practices. Implementing AI-driven solutions for integrating ESG considerations into accounting practices can be costly and resource-intensive, especially for smaller companies with limited budgets and expertise. Companies must carefully weigh the costs and benefits of such investments and prioritize initiatives that deliver the most significant value. Addressing these challenges requires collaboration between accounting professionals, data scientists, ESG experts, regulators, and other stakeholders to develop standardized frameworks, improve data quality and availability, and build trust in AI-driven decision-making processes. Despite the challenges, integrating accounting, AI, and ESG considerations promises to enhance corporate transparency, accountability, and sustainability in the long run.

By using the SDGs more actively in their ESG accounting and reporting, companies might still be able to “greenwash” and be tempted to use them more as window dressing that structures attempts to portray how well the company does. However, as this article has shown, ESG reporting is fundamentally about realistically communicating the positive and negative impacts of a company’s activities, and the demands—both from regulators and other stakeholders—for honest and nuanced data and analyses are growing stronger by the day. The next step following the work presented here is the development of the entire framework built on the principles described here, based on a wide range of sources that describe the integration between accounting, AI, and ESG.

CONCLUSION AND RECOMMENDATIONS

It is crucial to use the suggested framework to enhance comprehension and reporting on AI's effects on ESG for two reasons. The benefits of AI implementation in accounting and ESG practices extend beyond operational efficiency to encompass improved accuracy, risk management, compliance, decision-making, stakeholder engagement, and competitive advantage. Addressing the challenges of integrating accounting, AI, and ESG requires collaboration between accounting professionals, data scientists, ESG experts, regulators, and other stakeholders to develop standardized frameworks, improve data quality and availability, and build trust in AI-driven decision-making processes. Despite the challenges, integrating accounting, AI, and ESG considerations promises to enhance corporate transparency, accountability, and sustainability in the long run.

Using the paradigm presented here could help certain businesses better understand how sustainable their actions are. In cases when such awareness has been inadequate, activities may have changed. Most other companies' ESG-related effects may already be known to them. However, these might also be impacted by a framework that calls for greater transparency and in-depth research. The approach requires firms to reveal broader societal and economic repercussions and indirect effects; typical reporting frameworks do not mandate this. This will increase our comprehension of the effects and make it more difficult for businesses to ignore the detrimental effects. However, professionals must effectively utilize AI's potential in sustainable accounting. Using ACCA as inspiration, here is how: establish leadership in adopting AI, strategic delivery, and oversight, give data management a top priority, recognize the vendor landscape, develop relevant skills, use professional judgment, fight to greenwash, engage with stakeholders, and create sustainable value.

Organizations must cultivate a culture of innovation and continual development in addition to the fundamentals of ACCA's AI implementation in sustainable accounting. In order to comply with changing ESG norms and laws, this requires not only using AI technology but also continuously evaluating and improving their application. Organizations need to adopt a flexible strategy and actively look for ways to improve their AI-driven operations. Examples of such activities include optimizing algorithms for improved predictive analytics and utilizing AI-powered solutions to monitor ESG performance measures in real-time. By remaining abreast of technological developments and sustainable accounting best practices, firms can minimize risks and seize new growth and impact opportunities.

Furthermore, to optimize AI's potential in furthering ESG goals, industry players must effectively collaborate with one another. This collaboration involves alliances with academic institutions, non-governmental organizations, governmental bodies, and other significant participants in the ESG ecosystem, going beyond the confines of individual organizations. Through the exchange of expertise, materials, and industry best practices, stakeholders can work together to spur innovation and quicken the pace of achieving shared sustainability objectives. Additionally, establishing credibility and confidence for AI-driven sustainability efforts requires open and honest communication and interaction with external stakeholders like communities, investors, and consumers. Organizations may make sure that their AI-driven initiatives are in line with the goals and values of their stakeholders by requesting feedback and taking into account a variety of viewpoints. This will ultimately improve their reputation and competitive standing in the market.

In summary, enterprises can improve their sustainability performance and generate long-term value by integrating accounting, AI, and ESG issues. However, there are also substantial hurdles associated with this integration. Businesses can confidently navigate the complexities of sustainable accounting and encourage positive change towards a more sustainable future by adopting a collaborative and forward-thinking approach, effectively leveraging AI technologies, and cultivating a culture of continuous improvement and stakeholder engagement.

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