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AI-Enabled ESG Reporting: Bridging Sustainability and Accounting Practice

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Abstract

The growing importance of Environmental, Social and Governance (ESG) reporting has transformed the expectations placed on businesses, regulators and accounting professionals. Investors and stakeholders increasingly demand transparent and reliable information that goes beyond financial statements, while global standards such as IFRS S1 and S2 and the European Union's CSRD push for greater consistency in sustainability disclosures. At the same time, artificial intelligence (AI) is reshaping accounting practices by automating data collection, improving analysis and enhancing real time reporting. This paper explores how AI can support ESG reporting by strengthening accuracy, comparability and trust, while also addressing ethical and governance concerns. Drawing on accounting theory and sustainability frameworks, the study examines the opportunities and risks of using AI in ESG reporting and highlights implications for accountants, auditors and policymakers. The aim is to provide a conceptual foundation for integrating AI responsibly into ESG practices, ensuring innovation aligns with accountability.

Keywords: AI in Accounting, ESG Reporting, Sustainability Disclosure, Corporate Governance, IFRS Standards.

Introduction

In recent years, Environmental, Social and Governance (ESG) reporting has moved from being a voluntary practice to a global requirement for many organizations. Companies are increasingly expected to disclose not only their financial performance but also their impact on society and the environment. This shift has been driven by investors, regulators, and the wider public, who demand greater transparency and accountability. Frameworks such as the International Financial Reporting Standards (IFRS) S1 and S2, and the European Union's Corporate Sustainability Reporting Directive (CSRD), have placed ESG at the heart of corporate reporting, signaling a fundamental change in how businesses measure and communicate value.

At the same time, artificial intelligence (AI) is transforming the field of accounting and reporting. AI technologies are capable of processing large volumes of data, identifying patterns, and generating insights

at a speed and scale that traditional systems cannot match. For ESG reporting, AI has the potential to automate complex data collection, verify information in real time, and even detect signs of inaccurate or misleading disclosures. However, these technological advances also raise questions about reliability, ethics, and governance.

This paper explores the intersection of ESG reporting and AI, focusing on how technology can enhance the quality and comparability of sustainability disclosures while ensuring accountability. By examining the theoretical foundations of accounting and the practical challenges of ESG compliance, the study aims to provide a framework for responsible integration of AI into ESG practices. Ultimately, the research highlights how the combination of ESG and AI can contribute to a future where innovation and integrity work together to strengthen trust in corporate reporting.

Literature Reviews

Evolution of ESG Reporting and the Role of Technology

ESG reporting has shifted from a voluntary corporate gesture to a global requirement driven by investor expectations and regulatory mandates. Chen (2023) explores how artificial intelligence (AI) and other digital technologies are beginning to enhance the quality of ESG reporting, noting improvements in data accuracy and transparency across corporate disclosures. Similarly, Ecojoin (2024) examines the broader implications of AI for ESG performance, arguing that AI driven reporting tools could help companies achieve sustainability targets more efficiently while improving the reliability of public disclosures.

AI as a Transformative Force in Accounting

AI has become a major force in the accounting profession, reshaping data collection, auditing, and financial reporting practices. Hasan (2022) provides a comprehensive literature review on AI in accounting and auditing, highlighting how AI automates repetitive tasks and reduces human error. Wang and Cuthbertson (2022) extend this by assessing the current state and future perspectives of AI in accounting, showing how automation and predictive analytics are fundamentally changing the discipline.

Integrating ESG and AI in Reporting Frameworks

The intersection of ESG reporting and AI is a developing field. Lee, Perera, Liu, Xia, and Nottage (2024) propose a responsible AI assessment framework for ESG reporting, stressing the importance of governance and ethical oversight when embedding AI tools into sustainability disclosures. Rahim and

Tariq (2024) add that AI's role in green accounting and sustainability reporting is especially relevant in Industry 4.0, where companies are under pressure to deliver accurate environmental and social data in real time.

Empirical Evidence on AI Driven ESG Performance

Empirical studies are beginning to emerge that demonstrate AI's direct impact on ESG outcomes. For example, MDPI Sustainability Editors (2024) present evidence from Chinese firms showing that AI adoption leads to improved ESG performance and reporting quality. Research Gate Authors (2025) focus on how AI is reshaping carbon accounting, illustrating how automation allows companies to track emissions data with greater precision.

AI in ESG Assurance and Auditing

Several studies highlight AI's potential to transform ESG assurance, the process by which ESG disclosures are verified for accuracy. MTU Publications (2023) discuss how AI is already being applied in ESG assurance to improve audit efficiency and reduce inconsistencies. World Wide Technology (2023) further emphasizes the potential of AI to make ESG auditing more transparent and cost effective, while SSRN Contributors (2025) argue that ESG auditing must be reimagined entirely in the age of AI, with AI systems integrated into ledger systems for real time oversight.

Governance and Ethical Challenges of AI in ESG Reporting

While the benefits of AI in ESG reporting are clear, the literature also identifies ethical and governance concerns. AI introduces questions around algorithmic bias, data privacy, and accountability. Lee et al. (2024) stress the need for frameworks to ensure AI is used responsibly. Similarly, MTU Publications (2023) and World Wide Technology (2023) both note that without strong oversight, AI could undermine trust in ESG disclosures rather than enhance it.

Identified Research Gaps

Despite growing interest, gaps remain. Much of the research focuses on either AI in accounting or ESG reporting, with limited integration between the two fields. As Hasan (2022) points out, the literature has yet to produce a widely accepted model for AI enabled ESG reporting. Additionally, Rahim and Tariq (2024) argue that more work is needed to explore how AI can align with international standards such as IFRS S1, IFRS S2, and the Corporate Sustainability Reporting Directive (CSRD).

Rationale for This Study

Given these gaps, this study positions itself at the intersection of accounting theory, ESG reporting, and AI innovation. It builds on the work of Chen (2023), Wang and Cuthbertson (2022), and Lee et al. (2024) to conceptualize a framework for responsible AI enabled ESG reporting—one that strengthens accuracy, accountability, and global comparability.

Research Gap

Limited integration of ESG and AI in accounting research

- While there is extensive research on ESG reporting and a growing body of work on artificial intelligence in accounting, these studies largely operate in isolation. Few academic papers provide a unified framework showing how AI can be systematically applied to ESG reporting in line with accounting theory.

Lack of focus on regulatory alignment

- Global standards such as IFRS S1 and S2 and the European Union's CSRD are shaping ESG reporting requirements, but there is minimal research on how AI-enabled tools can support compliance with these regulations while maintaining consistency and comparability.

Insufficient exploration of ethical and governance concerns

- AI introduces new challenges such as algorithmic bias, data privacy risks and questions of accountability in reporting. Current research acknowledges these risks but does not deeply analyse how to embed governance safeguards when integrating AI into ESG reporting.

Sparse empirical studies on practical implementation

- Most existing work remains conceptual or theoretical. There is a lack of empirical research examining real-world corporate case studies of AI-driven ESG reporting or its impact on reporting quality, investor confidence and regulatory trust.

Overemphasis on Western corporate settings

- Much of the ESG literature focuses on developed economies, leaving a gap in understanding how AI can improve ESG reporting in emerging markets, where data infrastructure and regulatory frameworks may differ significantly.

No standard model for AI supported ESG reporting

- Currently there is no agreed-upon framework for integrating AI into ESG accounting practices. Researchers call for the development of a conceptual model that combines technology with accounting principles, ensuring that innovation complements rather than replaces human oversight.

Research Objectives

- To examine how artificial intelligence (AI) can be applied to Environmental, Social and Governance (ESG) reporting within the framework of accounting theory.This objective focuses on exploring the conceptual and practical integration of AI tools into sustainability reporting processes.

- To assess how AI supported ESG reporting can improve the accuracy, comparability and timeliness of sustainability disclosures.This will evaluate whether AI enhances data quality and helps meet the growing demand for transparent ESG information.
- To analyze the potential ethical and governance challenges arising from the use of AI in ESG reporting.This includes examining issues such as data privacy, algorithmic bias, and the need for oversight mechanisms.
- To evaluate how AI can support compliance with international regulatory standards, including IFRS S1 and S2 and the EU's CSRD.The study will consider whether AI tools can help align ESG reports with global reporting requirements.
- To propose a conceptual framework for responsible integration of AI into ESG reporting. The framework will outline how innovation can coexist with accountability, ensuring that technology strengthens rather than undermines trust in ESG disclosures.

Scope of the Study

- **Thematic Scope**

  The study focuses on the intersection of artificial intelligence (AI) and Environmental, Social and Governance (ESG) reporting, examining how technology can improve the quality, reliability, and accountability of sustainability disclosures within accounting frameworks.

- **Theoretical Scope**

  It draws on accounting theory to position ESG reporting as an extension of financial reporting and evaluates how AI can align with existing conceptual and regulatory models such as IFRS S1, IFRS S2, and the Corporate Sustainability Reporting Directive (CSRD).

- **Technological Scope**

  The research considers a range of AI applications relevant to ESG reporting, including automated data collection, trend analysis, anomaly detection, and real time verification of sustainability data.

- **Geographical Scope**

  While the study references global frameworks and international case examples, its findings are intended to be adaptable across both developed and emerging markets.

- **Regulatory Scope**

  The research evaluates how AI supported ESG reporting can respond to evolving international reporting mandates, with a focus on compliance with key global standards.

- **Practical Scope**

  The study aims to provide insights for accountants, auditors, regulators, and corporate decision makers by offering conceptual guidance for the responsible integration of AI into ESG reporting.

- **Exclusions**
  The study does not perform a technical evaluation of AI algorithms or software development. Instead, it focuses on the conceptual, ethical, and reporting implications of AI within the accounting discipline.

Methodology

This study adopts a conceptual and exploratory research design to investigate how artificial intelligence (AI) can support Environmental, Social and Governance (ESG) reporting within the framework of accounting theory. The approach combines a review of academic literature, regulatory frameworks, and industry reports to establish a solid foundation for the proposed conceptual model.

The study relies entirely on secondary data, drawing from peer reviewed journal articles, publications from regulatory bodies such as IFRS and the CSRD, and professional accounting reports produced by global firms including Deloitte, PwC, and KPMG. The primary evidence base consists of recent studies on ESG reporting, AI applications in accounting, and sustainability frameworks. Literature sources were selected using strict criteria of relevance, credibility, and recency. Research published between 2018 and 2025 formed the core of the review, while older landmark studies were included only when they provided essential theoretical insights.

A thematic content analysis was undertaken to identify recurring themes and knowledge gaps, focusing on issues such as ESG reporting challenges, AI capabilities, ethical risks, and regulatory implications. The findings were organized into categories representing opportunities, risks, and potential integration pathways for AI in ESG reporting.

The study also conducted a comparative review of major international frameworks, including IFRS S1 and S2, the European Union's CSRD, and the Sustainability Accounting Standards Board (SASB) guidelines. This review assessed how AI could help organizations comply with these requirements and achieve reporting consistency across jurisdictions.

Based on the synthesis of literature and regulatory analysis, a conceptual framework was developed to outline the responsible integration of AI into ESG reporting. This framework demonstrates how AI can improve reporting quality while addressing governance and ethical considerations.

Findings and Discussion

Artificial intelligence (AI) has the potential to significantly enhance the accuracy and reliability of Environmental, Social and Governance (ESG) reporting. The review indicates that AI can process vast amounts of ESG data from multiple sources, reducing manual errors and inconsistencies in sustainability

disclosures. By applying natural language processing and machine learning, AI can validate ESG metrics against regulatory frameworks such as IFRS S1 and S2, thereby improving alignment with global standards. This supports accounting theory's objective of faithful representation, ensuring that reported information reflects reality accurately.

AI also improves the timeliness and comparability of ESG information. It enables real time monitoring and reporting of ESG performance, helping companies meet stricter regulatory timelines such as those under the European Union's CSRD. Standardized AI driven reporting models enhance comparability across firms and regions, addressing one of the major criticisms of ESG reporting. These outcomes advance the goals of SDG 8, which focuses on Decent Work and Economic Growth, by fostering transparent and responsible business practices.

Another important finding is that AI supports risk detection and helps prevent greenwashing. AI systems can detect anomalies in ESG data, flagging potential cases where companies exaggerate sustainability claims. This contributes to ethical governance in accounting theory because it helps ensure that disclosures are not misleading and that stakeholders can trust the information provided.

AI enhanced ESG reporting also contributes directly to SDG 3, which focuses on Good Health and Well Being. By enabling more accurate reporting of workplace safety, employee welfare, and environmental impacts, AI allows companies to track health and safety data and take corrective action when needed. This proactive approach improves outcomes for employees and communities.

The analysis further shows that AI can reveal gaps in corporate ESG performance. By benchmarking company performance against ESG standards and industry peers, AI helps management and auditors identify weaknesses and address them strategically. This aligns with the decision usefulness theory in accounting, which emphasizes that information should help stakeholders make informed economic and social decisions.

Despite these benefits, ethical and governance challenges remain. The findings show that while AI brings important opportunities, it raises concerns including algorithmic bias, data privacy risks, and a lack of transparency in automated reporting processes. Accounting theory's principle of accountability suggests that firms must implement oversight mechanisms to ensure that AI tools enhance rather than undermine reporting integrity.

Finally, the study highlights the need for an integrated framework that merges accounting principles, ESG reporting standards, and AI applications. Such a framework would ensure that innovation is guided by governance structures, reinforcing trust, reliability, and global comparability in ESG disclosures.

Conclusion

This study examined how artificial intelligence (AI) can enhance Environmental, Social and Governance (ESG) reporting by aligning technological innovation with accounting theory and global sustainability frameworks. The findings highlight that AI has the potential to transform ESG disclosures by improving accuracy, timeliness, and comparability of data while reducing the risk of human error and greenwashing.

AI can support compliance with evolving regulatory requirements such as IFRS S1 and S2 and the EU's CSRD, helping companies meet increasing demands for transparency and accountability.

However, the study also underscores that technology alone is not a solution. The integration of AI into ESG reporting raises ethical, governance, and oversight concerns that must be addressed to maintain trust and integrity. Without clear frameworks and responsible practices, AI-driven ESG reporting could create new risks, including biased algorithms and opaque decision-making processes.

Overall, the paper demonstrates that combining accounting theory, sustainability goals, and emerging technology can create a path for more reliable, globally comparable ESG disclosures. By linking ESG reporting to Sustainable Development Goals **(SDG 3 and SDG 8)** the study reaffirms that innovation should ultimately serve the broader objectives of well-being, decent work, and economic growth.

Recommendations

Develop an AI-Supported ESG Reporting Framework: Companies, regulators, and academic institutions should collaborate to design a standardized framework that integrates AI tools into ESG reporting. This framework must align with accounting theory principles such as faithful representation and comparability, while meeting regulatory requirements like IFRS S1/S2 and CSRD.

Strengthen Ethical and Governance Safeguards: Organizations should establish clear governance protocols for AI use in ESG reporting, including transparency in algorithms, oversight committees, and accountability structures.
Independent audits of AI systems can prevent bias, ensure data integrity, and reinforce stakeholder trust.
Invest in Capacity Building and Training: Companies must train accountants, auditors, and ESG teams to understand and responsibly manage AI-driven reporting systems. Professional accounting bodies and universities should integrate AI literacy and ESG reporting modules into their curriculum.

Promote Regulatory Guidance and Standardization: Policymakers and standard setters should provide guidelines for AI-enabled ESG disclosures, ensuring consistent expectations across industries and regions. This will reduce confusion and help organizations comply with emerging sustainability mandates.

Encourage Research and Pilot Projects: Academics and industry partners should launch pilot studies to test AI tools in ESG reporting under real-world conditions. Insights from these projects can refine best practices and shape the future of ESG reporting models.

Embed AI in Broader Sustainability Strategies :Companies should view AI as more than a compliance tool and integrate it into broader corporate sustainability strategies.AI can help organizations track and improve ESG performance, contributing to SDG 3 (Good Health and Well Being) and SDG 8 (Decent Work and Economic Growth).

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