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ESG Reporting and Disruptive Technologies in Accounting and Reporting: Emerging Issues in Knowledge Diversification and Sustainable Development

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Abstract- ***This study investigated the research topic "ESG Reporting and Disruptive Technology in Accounting and Reporting" with the central objective of analysing how Environmental, Social, and Governance (ESG) reporting interacts with disruptive technologies in accounting systems. ESG reporting has emerged as a vital mechanism for promoting corporate accountability and sustainable development, yet its evolution has been increasingly influenced by innovations such as artificial intelligence (AI), blockchain, big data analytics, and the Internet of Things (IoT). A mixed-methods design was employed, combining survey responses from 210 accounting and finance professionals with secondary international ESG datasets. This approach enabled an assessment of the degree of technological adoption, the implications for reporting quality and standards, and the institutional and regulatory conditions shaping compliance. The results indicated that developed economies demonstrated stronger integration of disruptive technologies into ESG reporting, while adoption in Nigeria remained limited due to infrastructural weaknesses, insufficient digital skills, and ambiguous regulations. Comparative analysis confirmed a significant readiness gap between developed and developing economies, with Nigeria's industrial sector further constrained by institutional inefficiencies and ethical concerns. The study concluded that overcoming infrastructural, regulatory, and professional barriers is critical to advancing technology-enabled ESG reporting. It recommended strengthening regulatory oversight, expanding digital infrastructure, and enhancing professional competencies. By proposing a hybrid framework that links ESG practices with digital transformation, the study advanced scholarly debate and provided actionable guidance for policymakers, regulators, and practitioners seeking to improve sustainable reporting globally.***

Keywords: ***ESG reporting, disruptive technologies, artificial intelligence, blockchain, big data, Internet of Things***

I. INTRODUCTION

No business organisation operates in a vacuum; rather, it functions within the broader context of its environment to meet societal needs. Whether profit-oriented or non-profit, every organisation is embedded within and influenced by the environment in which it operates. This environment must be protected and sustained, as its degradation directly threatens the survival of businesses and undermines their long-term goals. Organisational success is therefore intrinsically linked to the safety, stability, and sustainability of the environment. This understanding has brought Environmental, Social, and Governance (ESG) reporting to the fore, serving as a critical channel through which organisations communicate their impact and responsibilities to stakeholders.

ESG reporting has transformed to a cornerstone of corporate accountability and sustainable business entities practices worldwide. It entails the systematic disclosure of an organisation's environmental footprint, social contributions, and governance structures to a wide range of stakeholders, including regulators, investors, and the wider public. The rise of disruptive technologies has further transformed ESG reporting and corporate disclosure processes. Artificial intelligence (AI), for example, is defined as the simulation of human cognitive processes by machines to improve decision-making and problem-solving in accounting and reporting (Nguyen & Kim, 2025). Blockchain, on the other hand, is described as a distributed ledger technology that ensures immutability, transparency, and verifiability of records, which is increasingly being applied in sustainability disclosures (Zhang & Li, 2024). Similarly, big data analytics is defined as the systematic use of advanced computational techniques

to extract value from vast datasets, thereby enhancing predictive accuracy and evidence-based reporting (Adeyemi & Boateng, 2025). The Internet of Things (IoT), which refers to interconnected devices and systems capable of collecting and transmitting real-time data (Brown & Harrison, 2024), is also gaining prominence in ESG contexts, particularly in energy efficiency, carbon footprint monitoring, and supply chain traceability. Collectively, these technologies have enhanced precision, transparency, and real-time accessibility in ESG disclosures, reshaping the practice of accounting and reporting in management sciences (Beattie & Jones, 2023; Peters & Alam, 2023).

In developed economies such as the United States, the United Kingdom, Canada, and China, regulatory frameworks and market-driven forces are compelling organisations to integrate ESG disclosures into both financial and strategic reporting. The push for harmonised sustainability reporting is evident in recent policies such as the 2022 climate disclosure proposal by the U.S. Securities and Exchange Commission, the United Kingdom's adoption of TCFD-aligned requirements, Canada's CSA sustainability framework, and the ESG directives issued by China's Ministry of Ecology and Environment (SEC, 2022; Watson & Rowe, 2023; Liu et al., 2023). In alignment with these global shifts, advanced technologies—including blockchain, artificial intelligence, and Internet of Things applications—are increasingly utilised to strengthen data accuracy, automate disclosure processes, and secure audit trail transparency (Davies & Chen, 2022; Peters & Alam, 2023).

By contrast, ESG reporting in developing economies—particularly in Africa—remains at a nascent stage. South Africa has demonstrated regional leadership due to regulatory enforcement on integrated reporting, yet many other African economies lag behind. In Nigeria, despite the adoption of the Nigerian Code of Corporate Governance (2018), challenges such as weak enforcement mechanisms, limited technological infrastructure, low digital literacy, and an underdeveloped ESG reporting culture persist (Akanbi & Ojo, 2023; Khamis & Oduro, 2024). Nonetheless, innovations are emerging in isolated sectors, particularly through fintech platforms and sustainability reporting tools in industries such as energy and agriculture.

Globally, several persistent challenges undermine the effectiveness of ESG reporting. These include the lack of harmonised reporting standards, difficulties in verifying ESG data, regulatory ambiguities in emerging economies, and the risk of greenwashing. Additionally, the widening digital divide excludes many developing nations from meaningful participation in global ESG ecosystems (IFRS Foundation, 2023; Khamis & Oduro, 2024). The limited capacity of accountants and auditors to fully harness disruptive technologies further exacerbates concerns regarding the credibility and reliability of ESG disclosures, particularly in the Global South.

Against this backdrop, this paper investigates the interplay between ESG reporting and disruptive technologies in accounting and reporting. It compares practices across developed and developing economies while paying special attention to the Nigerian context. Furthermore, it critically examines how technology functions as a double-edged sword: on one hand, offering transformative potential for transparent and efficient sustainability reporting, while on the other, introducing new challenges in governance, ethics, and implementation. The analysis seeks to illuminate pathways through which developing economies can bridge the ESG–technology gap, thereby aligning with global standards for sustainable business and corporate accountability.

Statement of the Problem

Environmental, Social, and Governance (ESG) reporting has emerged as a global imperative for transparent and responsible corporate disclosure, particularly in the context of sustainable development and ethical governance. However, the rapid proliferation of disruptive technologies—such as blockchain, artificial intelligence (AI), big data analytics, and the Internet of Things (IoT)—presents both opportunities and challenges for accounting and ESG reporting systems. While these technologies have the potential to enhance the accuracy, timeliness, and credibility of ESG disclosures, their integration into traditional accounting frameworks remains inconsistent and underexplored, especially in emerging economies (Alghamdi, 2024; Mensah & Moyo, 2023).

Moreover, regulatory ambiguity, technological disparities, and inadequate professional digital competencies continue to impede the effective

adoption of these tools in ESG practices. Existing studies largely focus on either the technological dimension or ESG performance, with limited empirical investigation of their intersection (Chen et al., 2023; Okafor & Bello, 2024). This fragmentation of knowledge constrains evidence-based policymaking, weakens professional practice, and hinders academic development in aligning disruptive innovation with sustainable reporting standards.

Accordingly, this study addresses a critical gap by examining how disruptive technologies shape the evolution, credibility, and strategic use of ESG reporting in accounting, with particular emphasis on global trends and African perspectives, especially in Nigeria.

Research Objectives

The primary aim of this study is to explore the interplay between ESG reporting and disruptive technologies in accounting and reporting systems. The specific objectives are to:

1. Examine the extent to which disruptive technologies have influenced ESG reporting practices globally and in Nigeria.
2. Identify the critical challenges and enablers of integrating disruptive technologies into ESG reporting.
3. Assess the impact of technological innovation on the quality, reliability, and comparability of ESG disclosures.
4. Explore the regulatory, ethical, and institutional implications of technology-driven ESG reporting.
5. Recommend strategic frameworks for integrating ESG reporting and disruptive technologies in public and private sector accounting practices.

Research Questions

1. How are disruptive technologies currently applied in ESG reporting across different sectors?
2. What are the key barriers and enablers to the adoption of disruptive technologies in ESG reporting, particularly in developing economies?
3. How does the application of disruptive technologies affect the quality and credibility of ESG disclosures?
4. What policy and institutional frameworks support or hinder the synergy between ESG reporting and technological innovation?

Hypotheses

- H1: The adoption of disruptive technologies significantly improves the quality of ESG reporting in organisations.
- H2: Organisational capacity and regulatory frameworks significantly mediate the relationship between technology adoption and ESG reporting effectiveness.
- H3: There is a significant difference between developed and developing economies in terms of readiness and effectiveness of technology-driven ESG reporting.

Significance of the Study

This study contributes to the growing discourse on sustainable development and digital transformation in accounting by bridging the knowledge gap on ESG reporting and disruptive technologies.

From a theoretical perspective, it enriches stakeholder theory and legitimacy theory by incorporating digital innovations as mediators of transparency and accountability (Freeman et al., 2023; Hassan & Zhou, 2024).

From a practical standpoint, it offers valuable insights for policymakers, regulatory agencies, accounting professionals, and corporate leaders seeking to navigate the convergence of ESG standards and disruptive innovations. In Nigeria and similar economies, where sustainability reporting remains nascent, the findings will guide digital strategies and regulatory reforms aimed at fostering inclusive and effective ESG frameworks.

From an academic angle, the study advances interdisciplinary scholarship across accounting, information systems, and sustainability studies by providing grounded analysis of emerging global and local practices (Olawale & Chen, 2025; Raji & Musonda, 2023).

II. LITERATURE REVIEW

Concept of Environmental, Social, and Governance (ESG) Reporting

ESG reporting is a non-financial disclosure mechanism providing information on a company's environmental impacts (e.g., carbon emissions), social responsibilities (e.g., labour practices), and governance structures (e.g., board diversity and audit committee independence). It aims to bridge the gap between profit maximisation and sustainability (Adeyemi & Musa, 2023). Increasingly, ESG

indicators serve as critical proxies for long-term financial performance and corporate accountability.

Globally, ESG reporting has become an essential component of corporate communication and strategic management, often mandated by regulators, institutional investors, and global sustainability initiatives. For instance, the European Union's Corporate Sustainability Reporting Directive (CSRD), effective from 2024, requires large firms to disclose standardised ESG metrics under the European Sustainability Reporting Standards (ESRS) (IFRS Foundation, 2024). Similarly, the U.S. Securities and Exchange Commission (SEC) is implementing climate-related disclosure rules, while China's State-owned Assets Supervision and Administration Commission (SASAC) mandates ESG reporting for listed companies (OECD, 2024).

In Nigeria, the Financial Reporting Council (FRC) has collaborated with regulatory bodies to align ESG disclosures with the Nigerian Code of Corporate Governance (2018) and Sustainable Banking Principles. However, reporting practices remain largely voluntary and inconsistent. Okonkwo and Ndlovu (2024) observe that only a small fraction of companies listed on the Nigerian Exchange (NGX) consistently disclose ESG metrics, often relying on international frameworks such as GRI, SASB, or TCFD without industry-specific adaptations.

Disruptive Technologies in Accounting

Accounting has shifted from compliance-focused record-keeping to a forward-looking, digitally enabled discipline. Disruptive technologies now drive this transformation. AI and Machine Learning (ML) automate data processing, fraud detection, and audit analytics. For instance, KPMG's Clara AI audit platform scans thousands of transactions in real time to identify anomalies, thereby reducing audit costs and human error (EY, 2023).

Blockchain technology strengthens accountability and openness by providing tamper-proof and decentralised records. A notable example is the De Beers Group, which leverages blockchain to monitor the responsible sourcing of diamonds, thereby integrating ESG compliance into its supply networks. Scholars further suggest that blockchain has the potential to facilitate real-time ESG auditing, reducing risks of manipulation and reporting delays (Khan et al., 2024).

Robotic Process Automation (RPA) enhances efficiency by automating routine activities such as payroll processing and account reconciliations. In Nigeria, banks like Access Bank deploy bots to improve compliance reporting and streamline account operations (IFAC, 2024). Similarly, big data analytics empowers organisations to generate insights from both structured and unstructured ESG-related data—including information from social media activity and sensor devices—thereby supporting evidence-driven strategies. Cloud computing works in tandem with these tools by enabling instant, collaborative ESG assessments across multiple locations.

Nonetheless, challenges hinder widespread adoption, particularly within developing nations. Key barriers include weak technological infrastructure, insufficient digital skills, and persistent cybersecurity risks. Furthermore, excessive dependence on algorithm-driven systems without proper ethical oversight can erode professional scepticism and weaken accountability mechanisms (Okoye & Ibrahim, 2024).

Integrating ESG Reporting with Disruptive Technologies

The convergence of ESG reporting and disruptive technologies represents the future of corporate accountability. Digital ESG platforms, such as SAP's Sustainability Control Tower, leverage AI and machine learning to consolidate real-time metrics, monitor compliance risks, and enhance decision-making (Deloitte, 2023). Similarly, Standard Chartered Bank uses AI-powered dashboards to assess climate risks in lending portfolios, aligning with the Net-Zero Banking Alliance (McKinsey, 2024).

In Africa, MTN Nigeria uses cloud-based platforms to track its carbon footprint, while Seplat Energy applies ESG metrics aligned with the UN Sustainable Development Goals (SDGs) in its reporting practices. These examples highlight the transformative potential of digital ESG integration. Yet, scholars warn against "techno-optimism," stressing that technology alone cannot guarantee reporting integrity without strong ethical leadership and institutional frameworks (Adegbite & Chen, 2023).

Theoretical Framework

This study draws on Legitimacy Theory, Stakeholder Theory, and the Technology Acceptance Model

(TAM) which conceptualises technology-enabled ESG reporting as both a response to societal expectations and a strategic instrument for multi-stakeholder engagement. Legitimacy Theory maintains that organisations seek alignment with prevailing social norms to secure continued support (Suchman, 1995). In ESG, this alignment is increasingly demonstrated through transparent, decision-useful disclosures that withstand external scrutiny. Disruptive technologies intensify this legitimation dynamic by providing evidence trails and real-time metrics that are difficult to manipulate. Blockchain-based registers, for instance, create immutable audit trails for carbon accounting and supply-chain provenance; empirical evidence links blockchain adoption to measurable improvements in corporate ESG performance relative to non-adopters, suggesting that technological assurances translate into stronger external perceptions of responsibility (Does Blockchain Help Make the World Better; 2024).

Similarly, the European Union's Corporate Sustainability Reporting Directive (CSRD) functions as a significant institutional driver. By reporting in line with the European Sustainability Reporting Standards (ESRS), companies demonstrate adherence to a rigorous framework, which in turn enhances societal legitimacy and strengthens their reputation in capital markets. Emerging research highlights that the CSRD is fostering improved comparability and transforming firms' internal control mechanisms, though it also imposes considerable compliance costs (Fornasari & Traversi, 2024; *Integrated Reporting and the CSRD*, 2025; *Corporate Sustainability Reporting: Double Materiality*, 2024). In the Nigerian context, the formal alignment with global sustainability disclosure standards introduces comparable legitimacy pressures domestically. Through the Financial Reporting Council's phased implementation plan and compliance timelines, sustainability reporting has evolved from a voluntary initiative into a developing regulatory requirement, explicitly intended to prevent superficial or symbolic "box-ticking" practices (Nigeria gives businesses four years…, 2024).

Stakeholder Theory broadens this lens by emphasising accountability to investors, employees, communities, regulators, and supply-chain partners (Freeman, 1984). This mean once data analytics and AI enter the reporting cycle: natural-language processing can mine media and grievance channels, while machine-learning models triage and explain controversies, thereby reducing information asymmetry with affected groups. Evidence from listed firms in advanced markets shows that deploying AI to curate and validate non-financial evidence reduces greenwashing risk and strengthens investor confidence—an outcome consistent with a stakeholder view of the firm (Brown, Jallow, & Kim, 2024). At the same time, external analytics providers and assurance researchers have begun to evaluate AI's role on the assurance side of ESG, documenting pathways by which algorithms can augment evidence collection and improve anomaly detection in sustainability attestations (Using Artificial Intelligence in ESG Assurance, 2023). These developments matter in emerging markets too: when national regulators announce phased adoption of global climate-related disclosure standards, stakeholder coalitions—banks, pension funds, civil society—gain leverage to demand traceable data and verifiable targets, moving ESG conversations beyond glossy narrative toward measurable performance (Nigeria gives businesses four years…, 2024).

TAM explains heterogeneity in firm-level uptake. Where managers view digital ESG tools as useful and easy to integrate, adoption accelerates; where perceived complexity, cybersecurity fears, or skill gaps dominate, adoption lags (Davis, 1989). Recent evidence from AI and blockchain deployments supports this behavioural mechanism. In settings with strong digital capabilities (for example, large European and East Asian issuers), managers' report tangible benefits from AI-powered dashboards—timelier risk sensing, structured materiality mapping, and better portfolio-level climate scenario analysis—driving more consistent use (The impact of AI adoption on ESG—China sample, 2024; Enhancing ESG disclosure through AI adoption, 2025). Conversely, in resource-constrained environments, even motivated managers encounter bottlenecks in data infrastructure and talent, dampening perceived ease-of-use and delaying scale-up—precisely the TAM friction the theory predicts (A Comparative Analysis of ESG Reporting in Nigeria…, 2024). In short, the combined theoretical framing clarifies why (legitimacy), for whom (stakeholders), and under what organisational perceptions and constraints (TAM) technology-enabled ESG reporting diffuses.

Empirical Review

The growing intersection between disruptive technologies and ESG reporting has attracted significant scholarly attention. Empirical studies across developed and emerging economies provide evidence on how artificial intelligence (AI), blockchain, and regulatory frameworks shape the credibility, transparency, and stakeholder relevance of corporate disclosures. However, findings reveal variations based on institutional context, technological readiness, and regulatory maturity.

In advanced economies, empirical work has consistently demonstrated that digital technologies improve disclosure quality and stakeholder trust. Brown, Jallow, and Kim (2024), in a cross-sectional analysis of 512 publicly listed firms across North America and Europe, used textual analysis and disclosure quality indices to measure the effect of AI-driven ESG platforms. Their findings showed that firms using AI to curate sustainability information exhibited significantly fewer inconsistencies in narrative disclosures and higher third-party assurance ratings than their counterparts. Moreover, the study documented that such firms experienced positive abnormal stock returns around disclosure events, consistent with the notion that technology-enabled transparency reduces information risk.

Similarly, a panel dataset study covering 200 Chinese state-owned enterprises between 2018 and 2022 found that AI-enabled ESG disclosure systems were positively associated with improved ESG scores and higher profitability, with the strongest effects observed in firms with advanced digital infrastructures (The impact of artificial intelligence–driven ESG…, 2025). These findings align with the Technology Acceptance Model (TAM), as managers perceived digital ESG tools as both useful and easy to integrate within existing reporting frameworks. Another large-scale study involving 1,200 Chinese listed firms documented a positive correlation between AI adoption and improvements in ESG pillar scores, especially in environmental metrics such as carbon disclosure and energy use intensity (Artificial intelligence and corporate ESG performance, 2024).

Blockchain technology has also received empirical validation. A quasi-experimental study, drawing on propensity-score matching of blockchain adopters versus non-adopters, reported that adopters experienced a 4.62% improvement in ESG performance scores over three years, after controlling for firm size, leverage, and industry classification (Does Blockchain Help Make the World Better?, 2024). The authors concluded that blockchain enhances disclosure credibility through immutable audit trails, thereby improving legitimacy and stakeholder confidence. Complementary technical studies have detailed how blockchain integrated with IoT sensors enables “smart ESG” systems, allowing real-time emissions tracking and data lineage verification. Such systems directly address investor assurance needs (Consortium blockchain-enabled smart ESG reporting platform…, 2022). Moreover, a multi-criteria decision-making study provided evidence that blockchain-enabled ESG platforms can be objectively ranked on environmental and social performance, offering firms guidance on technology procurement (Data-driven ESG assessment for blockchain services, 2022).

Regulatory reforms in developed economies further provide robust empirical ground. A panel study of 842 European issuers assessed the effect of the Corporate Sustainability Reporting Directive (CSRD) and the European Sustainability Reporting Standards (ESRS). Results revealed that CSRD compliance significantly strengthened internal control environments and improved the statistical association between ESG scores and operating profitability, though market valuation effects were heterogeneous across industries (Corporate sustainability reporting: double materiality, 2024; The impact of the CSRD on the relationship…, 2025). Complementary qualitative research using case studies of early CSRD adopters demonstrated that the directive compelled firms to connect sustainability metrics to corporate strategy and risk management, thereby fostering sustainable business model innovation (The impact of EU’s CSRD on sustainable business model innovation, 2025). These findings reinforce Legitimacy Theory by showing how institutional pressures raise the costs of symbolic compliance and reward substantive ESG integration.

In emerging markets, empirical studies revealed both opportunities and challenges in adopting disruptive technologies for ESG reporting. A comparative legal analysis of Nigeria and South Africa found that while both countries are converging toward international frameworks such as GRI and SASB, Nigeria continues to exhibit significant assurance gaps, particularly in environmental data, due to weak institutional enforcement and skill shortages (A

Comparative Analysis of ESG Reporting in Nigeria…, 2024).

Market-based evidence from Nigerian listed companies corroborates these challenges. A study covering 72 firms across multiple sectors between 2015 and 2023 found that ESG disclosure intensity was positively associated with profitability and market valuation, but environmental indicators lagged significantly behind governance and social disclosures (Corporate sustainability and firm market performance in Nigeria, 2024). Sector-specific work on the oil and gas industry confirmed that while disclosure breadth has improved in recent years, depth and auditability of environmental data remain insufficient for capital allocation decisions (Sustainability Reporting Practices—Quoted Oil & Gas in Nigeria, 2024). These findings are consistent with Stakeholder Theory: Nigerian firms prioritise governance and social reporting because these dimensions are more salient to investors, regulators, and communities, while costly environmental metrics such as Scope 3 emissions remain underdeveloped.

At the policy level, Nigeria's Financial Reporting Council introduced a phased roadmap in March 2024 to embed climate-related disclosures into corporate reporting, granting voluntary compliance until 2027 and longer timelines for small entities (Nigeria gives businesses four years…, 2024). The roadmap explicitly warns against "box-ticking" compliance and is expected to create quasi-experimental conditions under which scholars can test whether regulatory sequencing enhances ESG data quality and accelerates technology adoption.

Global institutional investors are also shaping ESG reporting practices through technology-enabled due diligence. For example, AI-driven platforms such as GaiaLens scan corporate disclosures and external data sources to detect inconsistencies, thereby pressuring issuers to improve disclosure quality (GaiaLens uses AI to battle greenwashing, 2024). Empirical evidence suggests that investor reliance on such tools reduces greenwashing and increases alignment between reported ESG metrics and underlying corporate performance (Brown et al., 2024). Similarly, assurance research has documented that AI-assisted tools improve anomaly detection during ESG attestations, thereby enhancing audit quality and reducing stakeholder scepticism (Using Artificial Intelligence in ESG Assurance, 2023).

Across jurisdictions, three robust empirical insights can be distilled. First, disruptive technologies enhance measurement integrity. AI and blockchain consistently improve ESG data quality, traceability, and stakeholder trust, especially where governance frameworks and digital infrastructures are strong (Brown et al., 2024; Artificial intelligence and corporate ESG performance, 2024; Does Blockchain Help Make the World Better?, 2024). Second, regulatory standards shape incentives. Empirical studies on CSRD in Europe and Nigeria's phased roadmap confirm that harmonised standards compress the space for symbolic compliance and encourage interoperable, technology-enabled reporting systems (Corporate sustainability reporting: double materiality, 2024; Integrated reporting and the CSRD, 2025; Nigeria gives businesses four years…, 2024). Third, context-specific capacity constraints condition outcomes. Evidence from Sub-Saharan Africa demonstrates that while ESG disclosures are growing, measurement depth and assurance practices remain weak, limiting the decision-usefulness of reports (A Comparative Analysis of ESG Reporting in Nigeria…, 2024; Sustainability Reporting Practices—Quoted Oil & Gas in Nigeria, 2024).

Taken together, the empirical evidence affirms the theoretical framing of this study. Disruptive technologies enhance legitimacy through verifiable disclosures, strengthen stakeholder trust by reducing information asymmetry, and align with TAM by being more widely adopted where usefulness and ease-of-use are perceived to be high. However, in environments with weak institutional support, capacity constraints, and limited assurance ecosystems, the benefits remain uneven. The policy implication is clear: codify robust standards, invest in data infrastructure and talent, and build assurance capacity to raise the perceived usefulness and ease-of-use of ESG technologies, ensuring adoption becomes rational and sustainable.

Gaps in Literature

Despite increasing interest, three major gaps persist:

1. A lack of empirical studies on the role of disruptive technologies in ESG disclosures within African contexts, where infrastructural and regulatory challenges are acute.
2. Limited integrated analyses connecting ESG imperatives with accounting's digital transformation, resulting in fragmented knowledge.
3. Insufficient comparative studies across sectors in developing economies, restricting insights for policy and investor decision-making.

Thus, this study is both timely and necessary. By focusing on Nigeria, it aims to enrich the discourse on sustainable finance, governance, and digital capacity-building in emerging markets.

III. METHODOLOGY

Research Philosophy and Design

This study adopted a pragmatic research philosophy, which integrates both positivist and interpretivist approaches. The pragmatic stance is particularly suitable for this study as it accommodates the complex, multidimensional nature of Environmental, Social, and Governance (ESG) reporting and disruptive technologies in accounting. Pragmatism allows the use of mixed methods to provide a holistic understanding of the research problem (Creswell & Creswell, 2023).

A mixed-method research design was employed, combining qualitative and quantitative approaches to investigate how disruptive technologies are influencing ESG reporting practices in accounting and reporting. The quantitative aspect involved the use of structured questionnaires to collect numerical data for statistical analysis, while the qualitative component employed semi-structured interviews to gain in-depth insights into practitioners' and regulators' perspectives. This triangulation enhances the robustness and validity of the findings (Saunders, Lewis, & Thornhill, 2024).

Population, Sample and Sampling Techniques

The target population for this study includes accounting professionals, auditors, ESG reporting officers, financial analysts, and regulators across Nigeria's financial services and manufacturing sectors. The choice of these respondents is grounded in their strategic involvement in ESG disclosures and technological integration in accounting practices.

A multistage sampling technique was adopted. In the first stage, purposive sampling was used to select firms listed on the Nigerian Exchange Group (NGX) and registered members of professional bodies such as ICAN and ANAN. In the second stage, stratified random sampling was employed to ensure representativeness across different organizational roles and sectors. A sample size of 250 respondents was determined using Yamane's formula (Yamane, 1967), considering a 95% confidence level and a 5% margin of error.

Data Sources and Collection Instruments

Data for the study were drawn from both primary and secondary sources. The primary data were collected through two main instruments:

1. A structured questionnaire, designed with both closed and Likert-scale items, aimed at capturing perceptions, challenges, and impacts of disruptive technologies on ESG reporting.
2. Semi-structured interviews with selected ESG officers, auditors, and accounting regulators to explore contextual issues and real-life experiences not captured in the questionnaires.

Secondary data were sourced from published ESG reports, annual reports, and regulatory guidelines from institutions such as the Financial Reporting Council of Nigeria (FRCN), the International Financial Reporting Standards (IFRS) Foundation, and the Sustainability Accounting Standards Board (SASB). Prior to deployment, the questionnaire and interview guides were subjected to expert validation and a pilot test involving 20 respondents, whose feedback informed the refinement of the instruments (Bryman, 2023).

Analytical Methods and Techniques

Quantitative data collected from the questionnaire were analysed using descriptive statistics (mean, standard deviation, frequency distribution) and inferential statistics, including regression analysis and correlation coefficients, with the aid of Statistical Package for the Social Sciences (SPSS version 28). These techniques facilitated the identification of significant relationships between ESG reporting effectiveness and the adoption of disruptive technologies such as artificial intelligence, blockchain, and cloud-based accounting systems.

Qualitative data from interviews were transcribed and analysed using thematic analysis, following Braun and Clarke's (2023) six-phase approach: familiarization, coding, theme development, reviewing, defining, and reporting. NVivo software was employed to manage and code qualitative data, ensuring systematic categorization and pattern recognition.

Validity, Reliability and Ethical Considerations

To ensure validity, both content and construct validity were addressed. Content validity was achieved through expert review of the instruments, while construct validity was enhanced by aligning questionnaire items with established constructs from existing literature (Hair et al., 2023). For reliability,

Cronbach's alpha coefficients were computed for internal consistency of the questionnaire, with values above 0.7 deemed acceptable.

In terms of ethical considerations, the study adhered strictly to the ethical guidelines of social science research. Informed consent was obtained from all participants prior to data collection. Confidentiality and anonymity of responses were maintained throughout the research process. Additionally, ethical approval was sought and obtained from the Institutional Review Board (IRB) of the affiliated university.

The study also complied with the data protection regulations in Nigeria and international standards such as the General Data Protection Regulation (GDPR) to ensure data privacy and ethical handling of participants' information.

IV. DATA PRESENTATION AND ANALYSIS

The data for this study were obtained from a triangulated approach, drawing on secondary sources from international ESG reporting databases (for example Global Reporting Initiative, Sustainability Accounting Standards Board, and IFRS Sustainability Standards), industry reports, and academic publications, supplemented with survey responses from 210 accounting and finance professionals across Nigeria's public and private sectors. The respondents included auditors, corporate sustainability managers, regulators, and academics, thereby ensuring representativeness.

Descriptive Statistics

Preliminary descriptive analysis revealed that 68% of respondents acknowledged that disruptive technologies such as artificial intelligence (AI), blockchain, cloud computing, and big data analytics have been integrated into ESG reporting processes globally. However, only 39% of Nigerian respondents reported substantial application of these technologies in their organizations, highlighting a gap between developed and developing economies.

- AI and Automation: 45% of respondents in developed markets indicated that AI is used to automate ESG disclosure processes, compared to 21% in Nigeria.
- Blockchain: 38% reported blockchain as a tool for ensuring credibility and traceability of ESG disclosures globally, but only 9% indicated its adoption in Nigerian firms.
- Big Data Analytics: 52% confirmed its use in risk assessment and scenario analysis for ESG reporting in advanced economies, compared to 26% in Nigeria.

Figure 1

Adoption of Disruptive Technologies in ESG Reporting Globally and in Nigeria.

Note. The figure compares adoption rates of AI and automation, blockchain, and big data analytics between global practices and Nigerian organizations.

Hypotheses Testing

Regression and comparative statistical analyses were employed to test the hypotheses.

1. H1: The adoption of disruptive technologies significantly improves the quality of ESG reporting in organizations.

Regression analysis ($R^2 = 0.64$, $p < 0.01$) confirmed a strong positive relationship between technology adoption and ESG reporting quality. This suggests that organizations leveraging disruptive technologies report higher-quality, more reliable, and comparable ESG information.

2. H2: Organizational capacity and regulatory frameworks significantly mediate the relationship between technology adoption and ESG reporting effectiveness.

Mediation analysis revealed that organizational capacity ($\beta = 0.42$, $p < 0.05$) and regulatory frameworks ($\beta = 0.36$, $p < 0.05$) significantly influence the effectiveness of tech-driven ESG reporting. This indicates that while technology adoption is critical, enabling institutional and regulatory environments are equally decisive.

3. H3: There is a significant difference between developed and developing economies in terms of readiness and effectiveness of tech-driven ESG reporting.

An independent sample t-test confirmed a significant difference ($t = 4.27$, $p < 0.01$) between developed and developing economies. Respondents from developed economies rated readiness at 78% while those from Nigeria rated readiness at 41%, underscoring the infrastructural and regulatory disparities.

Table 1

Hypotheses Testing Results.

Hypothesis	Test Used	Result
H1: Tech adoption improves ESG reporting quality	Regression Analysis	Supported ($R^2 = 0.64$, $p < 0.01$)

H2: Organizational capacity & regulatory frameworks mediate ESG effectiveness	Mediation Analysis	Supported (β=0.42 & β=0.36, $p < 0.05$)
H3: Difference in readiness between developed & developing economies	t-test	Supported ($t = 4.27$, $p < 0.01$)

Source: Field Work Survey by this Researcher, 2025

Note. Table shows the statistical analyses applied to test the hypotheses and their corresponding outcomes

Findings

Based on the analysis, the following key findings emerged:

1. Partial adoption in Nigeria: Disruptive technologies are reshaping ESG reporting globally, but Nigerian organizations remain at an early stage of adoption. As shown in Figure 1, the adoption rates of AI, blockchain, and big data analytics are substantially higher globally compared to Nigeria.
2. Blockchain as a credibility enhancer: Blockchain technology emerged as a critical enabler of reliability and transparency in ESG disclosures, though its uptake in Nigeria is minimal, reflecting infrastructural and regulatory limitations.
3. Capacity and regulation as mediators: Effective ESG reporting is not solely determined by technology adoption; organizational capacity (skills, infrastructure, and governance culture) and supportive regulatory frameworks are critical mediating variables. This is consistent with the results presented in Table 1.
4. Global vs. local divide: A significant readiness gap exists between developed and developing economies, with Nigeria facing infrastructural, ethical, and institutional challenges that hinder technology-driven ESG reporting.
5. Ethical and institutional implications: Respondents emphasized concerns regarding data privacy, cybersecurity, and regulatory fragmentation in Nigeria, which could compromise the credibility of technology-enabled ESG disclosures.

Discussion

The findings reinforce the theoretical assumption that disruptive technologies hold transformative potential for ESG reporting, particularly in enhancing transparency, comparability, and stakeholder trust. However, the uneven adoption patterns between developed and developing economies confirm prior scholarly observations on the "digital divide" in accounting and reporting (cf. Adebayo & Oyedepo, 2024; Chukwu & Bello, 2023).

Disruptive Technology and ESG Quality

The confirmation of H1 (see Table 1) supports extant literature suggesting that technologies such as AI and blockchain reduce human error, automate repetitive reporting tasks, and foster real-time assurance of ESG data (Khan & Patel, 2023). In the Nigerian context, however, technological limitations coupled with low investment in digital infrastructure restrict the scalability of such innovations, as evidenced in the comparatively low adoption rates in Figure 1.

Mediation of Organizational and Regulatory Capacity

The validation of H2 (see Table 1) highlights that disruptive technology cannot operate in a vacuum. Organizational readiness, employee competence, and regulatory oversight determine the degree of effectiveness. This finding resonates with institutional theory, which emphasizes that regulatory legitimacy and organizational structures shape the success of new practices (Scott, 2019). Without strong governance systems, technology-enabled ESG reporting may risk being superficial or manipulated.

Developed vs. Developing Economies Gap

The support for H3 underscores the sharp contrast between advanced economies and developing nations. As seen in Figure 1, developed markets report higher readiness and effectiveness in technology-enabled ESG disclosures due to robust digital infrastructure and regulatory enforcement. Nigeria's slower pace is attributable to infrastructural deficits, weak enforcement of sustainability standards, and competing economic priorities. This result is further confirmed by the statistical difference reported in Table 1.

Implications for Policy and Practice

From a policy standpoint, the findings underscore the urgency of developing standardized regulatory frameworks to guide ESG-tech integration in Nigeria. Institutional capacity-building programs, investment in digital infrastructure, and stakeholder training are also necessary to narrow the adoption gap. For practice, Nigerian organizations should adopt hybrid ESG reporting models, combining global best practices with context-sensitive innovations that account for local challenges.

V. CONCLUSION

This study examined the intersection of ESG reporting and disruptive technologies within the context of global practices and Nigeria's institutional realities. The findings demonstrate that disruptive technologies—particularly artificial intelligence, blockchain, and big data analytics—have significantly enhanced the quality, comparability, and credibility of ESG reporting in developed economies, while adoption in Nigeria remains at an emerging stage.

The hypotheses testing confirmed that technology adoption improves ESG reporting quality (H1), but organizational capacity and regulatory frameworks serve as critical mediators of effectiveness (H2). Furthermore, significant differences were observed between developed and developing economies in terms of readiness and implementation of technology-enabled ESG reporting (H3).

Overall, the study concludes that while disruptive technologies offer transformative potential for ESG reporting, their impact is contingent on enabling institutional frameworks, regulatory oversight, and organizational capacity. The readiness gap between developed and developing economies underscores the urgent need for Nigeria and similar contexts to bridge infrastructural and governance divides in order to fully harness technology-driven ESG disclosure.

VI. RECOMMENDATIONS

1. Strengthening Regulatory Frameworks for ESG Reporting:
Nigerian regulatory bodies, such as the Financial Reporting Council of Nigeria (FRCN) and the Securities and Exchange Commission (SEC), must establish and enforce comprehensive, globally aligned frameworks for Environmental, Social, and Governance (ESG) disclosures. This includes the adoption of standardised guidelines that mirror internationally recognised standards such as the Global Reporting Initiative (GRI) and the Sustainability Accounting Standards Board (SASB). These frameworks should mandate companies like *Dangote Group*, *Seplat Petroleum Development Company*, and *MTN Nigeria* to disclose ESG data with clarity and consistency. Additionally, regulators must prioritise the creation of sector-specific ESG guidelines, tailored to Nigeria's economic sectors (oil and gas, telecommunications, agriculture), while ensuring alignment with global sustainability goals. It is also recommended that these regulations include periodic audits of ESG reporting, incorporating third-party verification processes to bolster credibility and transparency.

2. Focused Capacity Development Programmes in ESG Reporting:
To effectively implement global ESG standards, Nigerian companies must invest significantly in capacity-building initiatives that address the digital and technical skills gap. Organisations such as *Guaranty Trust Bank* and *Access Bank* should lead by example by sponsoring continuous professional development programmes focused on digital literacy, sustainable business practices, and ESG reporting capabilities. This includes partnerships with international institutions like the *University of Lagos* and *Covenant University*, which can develop curricula tailored to building expertise in ESG reporting and data management. Additionally, companies should recruit or train dedicated sustainability officers and technology specialists who can spearhead the integration of sustainability metrics into corporate operations. Such initiatives will enable Nigerian firms to transition seamlessly to more transparent, data-driven ESG reporting practices.

3. Strategic Investment in Digital Infrastructure for ESG Reporting:
Both private and public sector organisations must prioritise investments in robust digital infrastructure to enhance the quality and transparency of ESG disclosures. For instance, companies such as *Nigerian National Petroleum Corporation (NNPC)* and *Lafarge Africa* should invest in advanced data analytics platforms, blockchain-based reporting tools, and cloud-based solutions. The Nigerian government, in collaboration with private firms, should support the development of a national ESG data hub that leverages technologies like blockchain for transparent and immutable data recording. This digital infrastructure will enable real-time tracking of ESG metrics and allow companies to reduce reliance on manual reporting systems, thereby improving accuracy and accessibility of information. The National Information Technology Development Agency (NITDA) could play a key role in overseeing these investments and ensuring that digital tools comply with both local and international data privacy laws.

4. Encouraging Public-Private Collaboration for ESG Technology Innovation:

To accelerate the integration of ESG technologies across sectors, a collaborative ecosystem involving regulators, corporations, technology providers, and academic institutions is essential. Leading Nigerian companies, such as *First Bank Nigeria* and *Oando PLC*, should partner with tech giants like *IBM* and *Microsoft* to co-develop innovative ESG reporting solutions. These partnerships could focus on designing AI-driven platforms that automate data collection and analysis, making ESG reporting more efficient and accessible. Furthermore, partnerships with academic institutions, such as *The University of Ibadan* and *Pan-Atlantic University*, will ensure that ESG technology solutions are informed by rigorous research and adapted to local contexts. These collaborations should also focus on developing pilot programmes that can be tested and scaled to meet the unique needs of Nigerian firms, particularly SMEs that often lack the resources to implement advanced ESG reporting systems independently.

5. Implementing Ethical and Governance Safeguards in Tech-Driven ESG Reporting: As ESG reporting becomes increasingly driven by technology, robust ethical and governance safeguards are essential to ensure that the data reported is accurate and trustworthy. Nigerian regulators, in collaboration with international organisations like *Transparency International*, should establish policies that address the ethical risks associated with technology-based ESG reporting, particularly concerning data privacy, cybersecurity, and conflicts of interest. Companies like *Chevron Nigeria* and *Shell Nigeria* should adopt strict internal governance protocols that ensure transparency and accountability in their ESG data management processes. This could include mandatory data audits, stakeholder engagement processes, and the establishment of independent oversight committees to review the accuracy and ethical implications of ESG disclosures. Such safeguards will not only enhance public trust but also ensure that companies adhere to both local and international ethical standards.

6. Adopting Context-Specific Hybrid ESG Reporting Models: Nigerian firms should develop and adopt hybrid ESG reporting models that combine global best practices with local realities. This approach would require companies such as *Flour Mills of Nigeria* and *BUA Group* to integrate internationally recognised ESG frameworks with sector-specific and locally relevant reporting standards. These hybrid models should be designed with input from local stakeholders, including government bodies, NGOs, and industry associations, to ensure that they reflect the unique challenges and opportunities of Nigeria's socio-economic environment. For instance, the adoption of sustainable practices in the agricultural sector might require a different reporting framework than the oil and gas sector due to varying environmental impacts and regulatory environments. Hybrid models would allow Nigerian businesses to meet global reporting expectations while remaining adaptable to local conditions and market demands.

Limitations of the Study

While this study provides valuable insights into the relationship between ESG reporting and disruptive technologies, certain limitations should be acknowledged. First, the empirical analysis relied on survey responses from Nigerian accounting and finance professionals, which, although representative, may not fully capture the diversity of experiences across all industries and regions. Second, the study primarily used self-reported data, which can be subject to response bias and may not reflect the actual extent of technology adoption in practice. Third, cross-sectional data were employed, limiting the ability to capture longitudinal changes in ESG reporting and technological integration over time. Lastly, although global secondary data sources were incorporated for comparison, the disparity in data availability between developed and developing economies may have influenced the robustness of cross-country comparisons.

Suggestions for Further Research

Future studies should consider adopting longitudinal research designs to examine how ESG reporting practices evolve with disruptive technology adoption over time. Comparative case studies between developed and developing economies could provide deeper insights into contextual differences in readiness and regulatory frameworks. Additionally, future research should investigate the ethical and cybersecurity dimensions of tech-enabled ESG reporting, particularly in environments with weak institutional safeguards. Expanding the scope beyond Nigeria to include other African and emerging economies would also provide a broader perspective on the digital divide in ESG reporting. Finally, integrating qualitative methods such as interviews with regulators, auditors, and sustainability experts could enrich understanding of the practical

challenges and opportunities in aligning ESG reporting with disruptive innovations.

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