



A Proposed Intelligent Accounting and Auditing Framework for Reforming ESG Disclosure and Enhancing Sustainability Governance in the Egyptian Capital Market: A Comparative Applied Research

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Abstract

Purpose and Design:

This research aims to evaluate the current state of Environmental, Social, and Governance (ESG) disclosure and assurance practices among Egyptian listed companies and proposes an intelligent accounting and auditing framework for restructuring ESG reporting. The purpose is to enhance sustainability governance, enable integration with the digital economy, and improve Egypt's ESG index participation in the capital market.

Methodology and Approach:

The Research adopts a mixed-methods approach, combining quantitative analysis of ESG disclosures of EGX-listed companies (2020–2024) with qualitative comparative case studies from developed capital markets (e.g., EU, Japan, and South Korea). It uses content analysis, disclosure scoring, and regression modeling to examine the relationship between ESG assurance, governance quality, and reporting outcomes.

Findings:

The findings reveal significant variability in ESG reporting quality, limited assurance practices, and fragmented governance integration across Egyptian listed firms. Notably, many EGX-listed companies are not registered in Egypt's ESG index. In comparison with global benchmarks, Egypt's ESG disclosure is less mature and lacks consistency, transparency, and comparability. The proposed framework introduces a restructuring pathway leveraging AI-based tools, standardization mechanisms, and independent assurance to improve ESG accountability.

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Originality and Value:

This research is original in proposing an intelligent audit-accounting reform model tailored to Egypt's unique capital market structure. It fills a significant empirical and policy gap by integrating ESG disclosure with strategic sustainability governance reforms. The value lies in enabling policy makers, regulators, and companies to operationalize ESG reporting into effective governance and investment attraction mechanisms.

Theoretical, Practical, and Social Implications:

Theoretically, the Research extends ESG reporting literature by integrating smart audit systems. Practically, it provides a pathway for the Financial Regulatory Authority (FRA) and EGX to mandate smart ESG disclosures. Socially, the Research promotes accountability, transparency, and sustainable development in Egypt's capital market.

Keywords:

ESG disclosure, sustainability governance, accounting innovation, auditing, Egypt, stock exchange, ESG index, digital transformation, Fifth Industrial Revolution.1. Introduction

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1. Introduction

1.1 Background and Context

The integration of environmental, social, and governance (ESG) disclosure within capital markets has become a critical pillar of sustainable development in the Fifth Industrial Revolution. This new era, marked by the convergence of intelligent automation, artificial intelligence, and big data, transforms how corporations engage with sustainability accountability and transparency (Schwab, 2016; Xu et al., 2021). ESG reporting frameworks are not merely compliance tools but serve as strategic mechanisms to attract investment, mitigate long-term risks, and enhance organizational legitimacy (Kotsantonis & Serafeim, 2019; Eccles et al., 2020).

In emerging markets, particularly Egypt, the implementation of ESG disclosure has faced structural and institutional challenges. While Egypt launched an ESG Index in 2010 in cooperation with Standard & Poor's, only a limited number of EGX-listed firms are currently included in the index, despite a growing global and regional focus on responsible investment (Egyptian Exchange, 2023). This low coverage rate reveals inefficiencies in ESG reporting practices, data standardization, and audit assurance (Ali & Elsayih, 2022; Gamerschlag et al., 2011).

Furthermore, the absence of a unified legal mandate and intelligent accounting and auditing frameworks restricts both the quality and inclusiveness of ESG disclosures (Bhasin, 2020; Elshabrawy & Nofal, 2021). Benchmarking against developed capital markets such as the European Union, South Korea, and the United States indicates that regulatory enforcement, digital integration, and assurance standards are key enablers of credible ESG ecosystems (EU Commission, 2022; Park et al., 2020).

Therefore, it is vital to evaluate Egypt's current ESG disclosure landscape and propose a reform framework that leverages digital and intelligent accounting systems, enhances audit reliability, and aligns the Egyptian ESG index with best international practices.

1.2 Statement of the Problem

Despite the global momentum toward sustainable finance and environmental, social, and governance (ESG) integration, Egypt's ESG disclosure land-

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scape remains underdeveloped and fragmented. Although the Egyptian Exchange (EGX) has initiated an ESG Index since 2010, participation among listed companies is sparse and often symbolic, with limited assurance mechanisms or digital traceability (Ali & Elsayih, 2022; Egyptian Exchange, 2023). Many EGX-listed firms either fail to disclose ESG metrics altogether or provide generalized, non-standardized information lacking comparability and relevance to stakeholders (Gamerschlag et al., 2011; Khlif et al., 2021).

Furthermore, the current ESG reporting practices in Egypt are not governed by a binding legal or regulatory framework, nor are they supported by intelligent accounting and audit methodologies capable of capturing sustainability-linked risks, performance, or impacts (Elshabrawy & Nofal, 2021; Bhasin, 2020). These gaps create significant asymmetries of information, weaken investor confidence, and impair the ability of national capital markets to attract ESG-aligned global capital (Eccles et al., 2020; Noh & Moon, 2021).

In contrast, several developed capital markets such as those in the European Union, Japan, and South Korea have adopted digital audit mechanisms, AI-enhanced materiality mapping, and mandatory ESG assurance processes to ensure high-quality disclosures (EU Commission, 2022; Park et al., 2020; KPMG, 2023). These innovations are absent in Egypt's reporting infrastructure, further exacerbating the misalignment between Egypt's ESG ambitions and actual reporting practice.

The core problem this research seeks to address is the absence of a comprehensive, intelligent, and enforceable ESG disclosure and auditing framework in Egypt. Without reform, Egypt risks marginalizing its listed companies from sustainable investment streams, undermining the national ESG index, and losing the opportunity to integrate into global sustainability finance ecosystems.

1.3 Research Objectives

This research seeks to achieve the following core objectives:

- 1.3.1 To assess the current status, limitations, and effectiveness of ESG disclosure and assurance practices among Egyptian Exchange (EGX)-listed companies, in alignment with international benchmarks.
- 1.3.2 To analyze the institutional, legal, and technological barriers that hinder comprehensive ESG reporting and auditing in Egypt, with emphasis on the gaps in intelligent accounting and digital audit frameworks.

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- 1.3.3 To develop an integrated intelligent framework for accounting and auditing ESG disclosures that is suitable for application in Egypt, and is consistent with practices in advanced capital markets.
 - 1.3.4 To provide applied comparative evidence between Egypt and selected developed countries (e.g., EU, South Korea, Japan) regarding ESG performance, assurance quality, and governance integration.
 - 1.3.5 To propose a national reform framework—potentially in the form of a presidential decree or regulatory directive—to restructure ESG reporting, improve the efficiency of the Egyptian ESG index, and expand participation among EGX-listed companies.

1.4 Significance of the Research

This Research holds theoretical, practical, regulatory, and social significance at both the national and international levels.

First, it contributes theoretically by bridging the gap between sustainability accounting and intelligent audit frameworks in emerging markets, particularly Egypt, where such interdisciplinary models are underexplored (Gray, 2010; Cho et al., 2015). The research extends prior literature by incorporating digitalization and AI-enhanced audit techniques into ESG reporting analysis, in line with evolving global standards (Khan et al., 2016; KPMG, 2023).

Practically, the Research provides stakeholders—including regulators, investors, and corporate managers—with a structured and evidence-based roadmap to improve ESG disclosure quality and assurance credibility across EGX-listed companies (Eccles & Krzus, 2018). This includes applied benchmarking with global leaders to guide digital transformation in ESG governance and reporting efficiency (Park et al., 2020).

On the policy front, this research supports Egypt's Vision 2030 and sustainable development agenda by identifying legislative and institutional reforms necessary to improve transparency and ESG compliance at the national level (Ministry of Planning, 2021).

Socially, the proposed framework fosters accountability, public trust, and stakeholder empowerment in alignment with global demands for ethical capitalism and corporate responsibility (Ioannou & Serafeim, 2017).

1.5 Research Questions

The main Research questions are :

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- 1.5.1 What is the current status and quality level of ESG disclosure and assurance among companies listed on the Egyptian Exchange (EGX)?
 - 1.5.2 To what extent do EGX-listed companies align with international ESG reporting standards and digital auditing benchmarks?
 - 1.5.3 What institutional, regulatory, or technological barriers hinder effective ESG reporting and auditing in the Egyptian capital market?
 - 1.5.4 How can an intelligent and integrated accounting and auditing framework improve ESG disclosure, enhance governance, and support sustainable development?
 - 1.5.5 What comparative lessons can be drawn from international case studies (e.g., EU, Japan, South Korea) to support ESG reform and expand the participation of Egyptian firms in ESG indices?

1.6 Scope and Limitations of the Research

Research Scope:

This research focuses on evaluating and reforming ESG disclosure and assurance practices among companies listed on the Egyptian Exchange (EGX) within the context of sustainable development and digital transformation. The Research covers the period from 2020 to 2024, coinciding with the global acceleration of ESG reporting and the Egyptian government's push toward Vision 2030.

It includes:

An empirical assessment of ESG disclosure practices in a representative sample of EGX-listed companies across various sectors (banking, industry, services).

Comparative benchmarking with ESG frameworks and practices in selected developed capital markets (e.g., EU, Japan, South Korea).

Evaluation of regulatory, technological, and institutional enablers and barriers.

Proposal of an intelligent, accounting-based and auditing-based ESG reform framework, with potential policy implications and legislative proposals.

Limitations:

The Research is limited to publicly available ESG reports and disclosures submitted to the EGX, FRA, and company websites.

It does not evaluate privately held companies or those not subject to ESG mandates.

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Variations in ESG reporting maturity between sectors may introduce sectoral bias.

The research may face data gaps or inconsistencies in disclosure quality, particularly in environmental metrics.

1.7 Structure of the Research

This Research is organized into ten sections:

- 1: Introduction – Establishes the background, problem statement, objectives, and significance.
- 2: Literature Review – Reviews global and local ESG disclosure and assurance literature.
- 3: Theoretical Framework and Hypotheses – Outlines the guiding theories and research hypotheses.
- 4: Proposed Framework – Presents the intelligent accounting and auditing framework and its components.
- 5: Research Methodology – Describes the research design, sample, tools, and analytical methods.
- 6: Findings and Results Analysis – Displays the empirical results and evaluates ESG disclosure practices.
- 7: Case Studies Analysis – Compares Egypt's practices to global benchmarks through real cases.
- 8: Discussion and Interpretation – Interprets findings in relation to theory and prior studies.
- 9: Policy and Practical Recommendations – Provides regulatory, professional, and institutional reform directions.
- 10: Conclusion and Future Directions – Summarizes contributions and outlines paths for future research.

2: Literature Review

2.1 The Evolution of ESG Disclosure and Reporting Standards

Environmental, Social, and Governance (ESG) disclosure has emerged as a pivotal tool for promoting responsible corporate behavior and guiding sustainable investment decisions. The ESG concept evolved from earlier notions of Corporate Social Responsibility (CSR), transitioning toward a more measurable, performance-based model that enables investors and stakeholders to assess

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non-financial risks and long-term value creation (Eccles & Krzus, 2018; Kotsantonis & Serafeim, 2019).

Globally, ESG disclosure has become increasingly formalized through standardized reporting frameworks. The Global Reporting Initiative (GRI), founded in the late 1990s, was among the first to propose systematic sustainability metrics, which later influenced the development of other standards such as the Sustainability Accounting Standards Board (SASB), the Carbon Disclosure Project (CDP), and the International Integrated Reporting Council (IIRC). These frameworks aimed to provide comparable, verifiable, and material ESG data across sectors and regions (GRI, 2021; SASB, 2020).

In 2021, the establishment of the International Sustainability Standards Board (ISSB) under the IFRS Foundation marked a significant step toward harmonizing ESG reporting globally. The ISSB's release of IFRS S1 and S2 in 2023 provides a unified baseline for sustainability- and climate-related disclosures, integrating financial materiality with environmental and governance dimensions (IFRS Foundation, 2023). This shift reflects a growing investor demand for ESG information that is as reliable and decision-useful as financial data (World Economic Forum, 2020).

Moreover, governments and stock exchanges have begun to mandate or encourage ESG disclosures through listing requirements and national sustainability strategies. For instance, the European Union's Corporate Sustainability Reporting Directive (CSRD) requires large companies to report detailed ESG information under digital and assured formats starting in 2024 (European Commission, 2022).

As ESG becomes integral to risk management and corporate valuation, the role of accountants and auditors in measuring, verifying, and assuring ESG performance has expanded significantly (Simnett et al., 2009; IFAC, 2022). The next section explores the specific challenges and opportunities of implementing ESG disclosure in emerging markets.

2.2 ESG Disclosure in Emerging Markets: Challenges and Practices

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While ESG disclosure has gained significant traction in developed economies, its implementation in emerging markets faces institutional, cultural, and regulatory obstacles (El Ghouli et al., 2018; Fernando et al., 2022). In many cases, ESG reporting is voluntary, fragmented, or limited to form over substance, undermining its role in promoting transparency and sustainable investment decisions (Mahmood et al., 2019).

One of the primary barriers is the lack of institutional capacity and standardized guidance tailored to local contexts. Many emerging markets, including Egypt, suffer from limited regulatory enforcement, weak governance frameworks, and inadequate infrastructure for collecting and verifying ESG data (Ali et al., 2020). This results in inconsistent reporting quality and undermines investor confidence in ESG claims.

Moreover, firms often view ESG reporting as a compliance burden rather than a strategic opportunity, especially in jurisdictions where ESG metrics are not directly linked to capital access, investor engagement, or stock performance (Tariq et al., 2021). The cost of integrating ESG systems, training staff, and engaging external assurance providers can be prohibitively high for small and mid-sized enterprises in these markets (IFC, 2020).

Despite these limitations, several emerging markets have made notable progress. Brazil's B3 exchange introduced the "ISE" ESG index in 2005, South Africa's Johannesburg Stock Exchange mandated integrated reporting, and Malaysia's Securities Commission requires ESG risk disclosures under its sustainable finance agenda (World Bank, 2021). These cases illustrate that tailored regulation, capacity-building, and investor incentives can improve ESG practices even in resource-constrained contexts.

Egypt has taken initial steps through the Egyptian Exchange's ESG guidelines, the Financial Regulatory Authority's encouragement of sustainability reporting, and recent national strategies for sustainable development (FRA, 2023). However, ESG adoption remains limited in scope and often lacks alignment with international standards or investor expectations (El-Far & Ghoneim, 2022).

Thus, a context-sensitive reform framework that considers local challenges while aligning with global benchmarks is essential to enhance ESG effectiveness in emerging markets.

2.3 ESG Disclosure and Financial Reporting Quality: The Role of Accounting and Auditing

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The integration of ESG disclosures into the corporate reporting ecosystem has raised critical questions about the quality, consistency, and credibility of the disclosed information (Christensen et al., 2021). As ESG reporting evolves from voluntary narratives to investor-relevant metrics, the role of accounting and auditing becomes central to improving the reliability and comparability of sustainability information (KPMG, 2022).

Accounting systems serve as the infrastructure for quantifying ESG-related performance, particularly environmental costs, carbon emissions, employee welfare expenditures, and governance controls (IFAC, 2020). However, traditional financial reporting standards often lack the scope and flexibility to accommodate non-financial disclosures, resulting in fragmented or inconsistent integration of ESG data into annual reports (Barth et al., 2020).

Moreover, internal control mechanisms, including risk management systems and compliance frameworks, are pivotal in ensuring that ESG information is complete, verifiable, and traceable (Deegan, 2019). Recent developments such as the International Sustainability Standards Board (ISSB) and the European Sustainability Reporting Standards (ESRS) seek to bridge the gap between financial and ESG reporting by creating standardized ESG metrics that can be audited and assured (IFRS Foundation, 2023).

Assurance of ESG disclosures, whether through limited or reasonable assurance engagements, is gaining global prominence as investors demand higher levels of trust in sustainability reporting (IAASB, 2021). Auditors, especially in Egypt, face challenges including absence of regulatory mandates, lack of ESG audit methodologies, and insufficient training (Zaki & Elmasry, 2022).

Recent studies have found positive associations between ESG disclosure quality and financial reporting quality, market value, and stakeholder trust (Alareeni & Hamdan, 2020; García-Sánchez et al., 2019). This correlation underlines the need for an integrated assurance framework that combines traditional audit principles with ESG-specific tools to enhance corporate transparency and accountability.

2.4 ESG Reporting Practices and Challenges in Egypt

Despite growing awareness of ESG issues globally, ESG disclosure practices in Egypt remain at an early stage compared to developed capital markets

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(PwC, 2022). The Egyptian Exchange (EGX) has issued voluntary ESG disclosure guidelines since 2016, encouraging listed companies to report on environmental, social, and governance indicators (EGX, 2016). However, these disclosures are neither mandatory nor systematically enforced, resulting in significant variation in content, quality, and accessibility across firms (UNCTAD, 2020; Hegazy et al., 2022).

A key structural limitation is that most EGX-listed companies are not part of the ESG Index launched in collaboration with Standard & Poor's in 2010. According to recent reports, only a limited number of companies voluntarily report ESG metrics, and even fewer are subject to independent verification (UNDP, 2023). Moreover, the ESG Index itself has been criticized for low transparency in methodology, insufficient market influence, and limited investor awareness (Khan, 2021).

In addition, institutional and regulatory challenges constrain ESG progress in Egypt. These include a lack of mandatory ESG frameworks, weak incentives, limited integration of ESG into corporate governance, and insufficient training of preparers and auditors (OECD, 2021; El-Gazzar & Hussain, 2023). Many companies perceive ESG reporting as a compliance burden rather than a strategic opportunity, which hinders broader adoption and innovation (Nasr & Moussa, 2022).

Furthermore, there is limited alignment between ESG disclosures and financial reporting systems, which reduces the usability of ESG data by investors and regulators (GIZ, 2023). A disconnect between ESG performance and financial outcomes also limits the development of integrated investment strategies in Egypt's capital market (World Bank, 2022).

Addressing these challenges requires a transformative accounting and assurance framework that fosters standardization, enhances the credibility of ESG information, and strengthens investor confidence in Egypt.

2.5 The Role of Accounting and Auditing in Enhancing ESG Quality and Assurance

Accounting and auditing professions play a pivotal role in ensuring the reliability, comparability, and credibility of ESG disclosures (IFAC, 2022). As ESG reporting expands globally, stakeholders increasingly demand rigorous assurance mechanisms to validate reported sustainability data, especially with rising concerns about greenwashing and inconsistent metrics (IAASB, 2023). Accountants are key in embedding ESG elements into financial systems, while

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auditors ensure the integrity of non-financial disclosures through standard-based assurance frameworks.

In leading capital markets, professional bodies such as the AICPA, ACCA, and the IFRS Foundation are advancing sustainability-related reporting and assurance standards (IFRS, 2023). The introduction of ISSB's IFRS S1 and S2 standards represents a milestone toward harmonizing ESG disclosures with financial statements, allowing accountants to serve as strategic enablers of sustainability governance (KPMG, 2023).

Empirical studies show that robust accounting frameworks improve the quality of ESG data, facilitate internal control integration, and enhance the materiality and traceability of reported ESG metrics (Simnett et al., 2020; Quick et al., 2021). Meanwhile, the credibility of ESG reporting increases when subject to independent assurance, particularly when performed under ISAE 3000 or similar high-quality standards (Maroun, 2022).

In Egypt, the fragmented role of accountants and auditors in ESG-related activities contributes to reporting inconsistencies. Few firms engage professional accountants in preparing ESG reports, and assurance engagements are often performed on a limited or voluntary basis (Elgammal et al., 2022). There is a need to formalize the role of professional accountants as ESG integrators and assurance providers, supported by regulatory frameworks and capacity-building.

Thus, an intelligent accounting and auditing framework tailored to Egypt's ESG reporting needs could bridge existing quality and governance gaps, helping listed firms deliver transparent, comparable, and decision-useful sustainability information to stakeholders and the market.

2.6 Literature Gap and Research Excellence of the Research

Despite the increasing global attention on Environmental, Social, and Governance (ESG) disclosures, a substantial gap exists in emerging capital markets—particularly in Egypt—regarding the integration, assurance, and governance alignment of ESG reporting practices. While prior studies such as Haji & Anifowose (2016), Kılıç & Kuzey (2018), and Al Hawaj & Buallay (2022) examined ESG disclosure in developing contexts, few have focused on the empirical performance and assurance quality of ESG reporting in Egyptian Exchange (EGX)-listed companies. There is a lack of granular evidence evaluating how these disclosures align with sustainability governance, international benchmarks, and capital market indices such as the ESG Index of EGX.

Moreover, most research does not adequately consider the role of accountants and auditors as strategic enablers of ESG integration (Simnett et al., 2009; Flower, 2015). There is limited discourse on leveraging digital or intelligent

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technologies—such as artificial intelligence (AI), natural language processing (NLP), and automated assurance—in structuring ESG disclosures within corporate reporting frameworks (Appelbaum et al., 2017; Trieu et al., 2021).

Additionally, the current regulatory and institutional frameworks in Egypt are fragmented, offering minimal coordination between financial reporting standards and ESG-related disclosures (Rizk et al., 2008). As such, there is no unified intelligent framework that bridges the dual objectives of ESG assurance and sustainability governance in listed firms, especially in alignment with the International Sustainability Standards Board (IFRS S1/S2) and ISAE 3000 principles.

Table 1 below illustrates the major literature gaps and how this research addresses them through an innovative, comparative, and policy-relevant framework.

Table 1: Literature Gaps and Research Contributions

Literature Gap	Contribution of This Research
Lack of empirical studies on ESG assurance in EGX-listed companies	Provides empirical evidence from EGX firms using survey and case analysis
Limited role of accountants in ESG integration in emerging markets	Positions accountants and auditors as central actors in ESG disclosure and governance
No unified intelligent framework for ESG reporting and assurance	Develops a comprehensive intelligent accounting and auditing framework
Absence of applied comparative benchmarking with global practices	Benchmarks Egypt's practices with international standards (e.g., IFRS S1/S2, EU CSRD, ISSB guidelines)
Fragmented regulatory approach to ESG in Egypt	Proposes regulatory and institutional reforms based on empirical and comparative findings
Insufficient evaluation of ESG index efficiency in EGX	Assesses ESG index inclusion gaps and proposes clear enhancement criteria
Lack of harmonization between financial and ESG reporting in Egypt	Promotes integrated reporting aligned with ISSB and ISAE 3000 and GRI frameworks

The excellence of this research lies in its novel integration of digital accounting and audit mechanisms with ESG governance, tailored specifically to the challenges and regulatory setting of Egypt's capital market. It introduces applied benchmarking with leading markets—such as the EU, UK, South Korea, and Malaysia—and proposes a scalable model capable of institutional adoption. Additionally, this Research contributes to stakeholder theory, institutional theory, and assurance theory by contextualizing the practical role of

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accountants in sustainability transformation (Freeman et al., 2004; DiMaggio & Powell, 1983).

3: Theoretical Framework and Hypotheses Development

3.1 Introduction to the Theoretical Framework

This research relies on a multi-theoretical approach to provide a robust foundation for evaluating and reforming ESG (Environmental, Social, and Governance) disclosure practices among EGX-listed companies. The integration of theories such as stakeholder theory, legitimacy theory, assurance theory, and digital transformation theory offers a comprehensive understanding of the motivations, mechanisms, and innovations driving sustainability governance and ESG reporting. Adopting this framework supports the identification of behavioral, institutional, and technological factors that impact the effectiveness of ESG disclosures and their alignment with global standards such as GRI, ISSB, and ISAE 3000.

The use of multiple theoretical lenses allows for a layered understanding of corporate behavior. Stakeholder theory explains the pressure exerted by investors, regulators, and civil society to enhance ESG transparency. Legitimacy theory addresses how companies respond to regulatory and reputational incentives to gain or maintain social legitimacy. Assurance theory underpins the role of external audits in building trust and information reliability. Finally, digital transformation theory supports the adoption of intelligent audit systems, automated data integration, and AI-powered dashboards to improve ESG reporting processes.

This sets the theoretical foundation for the proposed intelligent accounting and auditing framework and justifies the empirical hypotheses formulated in later sections. It also enables a critical comparative evaluation of Egypt's current ESG environment in light of international theoretical benchmarks.

3.2 Stakeholder Theory and ESG Reporting

Stakeholder theory, developed by Freeman (1984), provides a foundational perspective on why companies engage in ESG reporting by recognizing the influence of multiple parties beyond shareholders—such as employees, regulators, communities, and civil society—on corporate strategies and disclosures. The theory argues that firms must respond to the expectations and informational needs of all stakeholders to ensure legitimacy, long-term value, and resilience in their operating environment (Freeman, 2010; Mitchell et al., 1997).

In the context of Egypt, stakeholder theory is especially relevant due to increasing demands from investors, regulators, and development institutions (e.g., the FRA, UNDP, and IFC) for enhanced ESG practices among EGX-listed firms. These expectations are amplified by Egypt's commitment to the UN Sustainable Development Goals (SDGs) and Vision Egypt 2030, which emphasize corporate responsibility and environmental governance (UNDP, 2023). Stakeholder engagement in ESG is also reflected in growing pressure

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from institutional investors and regional ESG funds seeking greater transparency and standardized disclosures (Elgammal et al., 2018).

Firms that prioritize stakeholder concerns in ESG disclosures are likely to experience reputational benefits, greater access to capital, and improved operational risk management (Clark et al., 2015; Eccles & Klimenko, 2019). Moreover, stakeholder-oriented reporting practices reinforce the legitimacy of ESG strategies and justify regulatory and market-based incentives such as inclusion in ESG indices or access to green financing.

Therefore, stakeholder theory serves as a key theoretical lens in this Research to explain ESG disclosure dynamics and inform the design of the proposed intelligent accounting and auditing framework.

3.3 Legitimacy Theory and Institutional Isomorphism

Legitimacy theory posits that organizations strive to ensure their actions are perceived as desirable, proper, or appropriate within socially constructed systems of norms and values (Suchman, 1995). In ESG reporting, legitimacy is achieved when firms align their disclosures with societal and regulatory expectations, enhancing their acceptance by stakeholders, regulators, and capital markets (Deegan, 2002; Michelon et al., 2015).

This alignment often leads to institutional isomorphism—a concept introduced by DiMaggio and Powell (1983)—which explains why organizations in similar environments adopt comparable structures and reporting practices to maintain legitimacy and reduce uncertainty. In the Egyptian context, EGX-listed firms increasingly mimic global best practices in ESG disclosure due to pressure from international investors, multilateral funding institutions, and compliance obligations (Elgammal et al., 2018). This isomorphic behavior is evident in voluntary adoption of GRI standards, TCFD principles, and recently the ISSB guidelines.

Regulatory encouragement by the Egyptian Financial Regulatory Authority (FRA) and the Central Bank of Egypt (CBE) further contributes to coercive isomorphism, where firms conform to emerging ESG norms to secure legitimacy and access capital (FRA, 2022; Soliman et al., 2021). Furthermore, professional bodies and peer benchmarking foster mimetic and normative isomorphism.

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Thus, legitimacy theory and institutional isomorphism provide a theoretical foundation to explain ESG convergence and justify the development of a standardized, intelligent accounting and auditing framework that aligns local ESG practices with global expectations.

3.4 Assurance Theory and Quality of ESG Disclosure

Assurance theory posits that independent verification enhances the credibility and reliability of reported information, especially when information asymmetry exists between management and stakeholders (Power, 1997; Simnett et al., 2009). ESG disclosures, being largely non-financial, are vulnerable to greenwashing or selective reporting; therefore, external assurance serves as a mechanism to improve trust, transparency, and comparability (Martínez-Ferrero et al., 2018).

In emerging markets like Egypt, ESG assurance is still underutilized and lacks standardization (Soliman et al., 2021). Most listed firms either provide unaudited ESG statements or rely on general narrative reporting without quantifiable indicators or third-party validation. This creates challenges for investors who rely on ESG data to make sustainable investment decisions (Hummel & Schlick, 2016).

By integrating assurance theory, this Research highlights the critical role of auditors and accounting professionals in enhancing ESG disclosure quality through verification, benchmarking, and the application of international assurance standards such as ISAE 3000 and the upcoming ISSA 5000. The proposed intelligent framework seeks to institutionalize ESG assurance within Egypt's capital market infrastructure to address information risk and align disclosure with international investor expectations.

3.5 Digital Transformation Theory and Intelligent Frameworks

Digital transformation theory posits that the integration of digital technologies reshapes organizational processes, governance structures, and stakeholder communication (Bharadwaj et al., 2013; Vial, 2019). In the context of ESG reporting, digital transformation enables automation, real-time data analytics, and integrated reporting platforms that can enhance the timeliness, comparability, and reliability of sustainability disclosures (Gartner, 2021).

For EGX-listed companies, adopting intelligent digital frameworks such as robotic process automation (RPA), blockchain-enabled assurance, and AI-based ESG dashboards can improve data traceability, enhance the quality of

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assurance, and reduce manual reporting errors (Appelbaum et al., 2017; Garcia-Torea et al., 2020). These technologies allow for interactive, stakeholder-centric ESG communication aligned with international standards such as GRI and ISSB.

This research utilizes digital transformation theory to justify the need for reengineering ESG reporting systems in Egypt through intelligent accounting and auditing infrastructures. It underlines how smart technologies can overcome current ESG inefficiencies by providing a transparent, auditable, and adaptive reporting ecosystem that serves both regulatory and investment objectives.

3.6 Summary and Integration of Theoretical Frameworks

This Research integrates multiple theoretical lenses to comprehensively examine the effectiveness and reform of ESG disclosure and assurance in Egypt's capital market. Each theory contributes a unique explanatory dimension:

- Stakeholder Theory underpins the social demand for transparent and credible ESG disclosures that satisfy investors, regulators, and civil society (Freeman, 1984; Hörisch et al., 2014).
- Legitimacy Theory explains why firms may disclose ESG information to gain societal acceptance and maintain regulatory favor (Suchman, 1995; Deegan, 2002).
- Assurance Theory justifies the need for independent verification mechanisms to enhance disclosure quality and reduce information risk (Simnett et al., 2009; Martínez-Ferrero et al., 2018).
- Digital Transformation Theory positions intelligent technologies as strategic enablers for transforming ESG reporting into real-time, verifiable, and adaptive frameworks (Bharadwaj et al., 2013; Vial, 2019).

Together, these theories create a conceptual foundation for the proposed intelligent accounting and auditing framework. They highlight how corporate ESG behavior is shaped by stakeholder expectations, legitimacy dynamics, assurance quality, and digital maturity. The framework, therefore, aligns with global norms while being customized for the regulatory, technological, and socio-economic context of Egypt.

Table 2 presents a comparative synthesis of these theoretical frameworks and how each informs key dimensions of the proposed reform.

Table 2. Theoretical Frameworks Integrated in the Proposed ESG Reform Model

Theory	Core Premise	Relevance to ESG Reform in Egypt	Key Constructs Applied
Stakeholder Theory	Firms must serve the interests of all stakeholders	Elevates investor and civil society demand for quality ESG disclosure	Accountability, Dialogue, Transparency
Legitimacy Theory	Firms seek alignment with social and regulatory norms	Explains voluntary or symbolic ESG disclosure practices in Egypt	Symbolic Compliance, Reputation, Societal Alignment
Assurance Theory	Verification enhances credibility of disclosed information	Supports introducing independent ESG assurance mechanisms	Reliability, External Validation, Audit Engagement
Digital Transformation	Technology reconfigures organizational processes	Enables smart ESG dashboards, data integration, and automated reporting	AI, RPA, Blockchain, Real-Time Analytics

4: Proposed Framework and Interactions of Its Components

4.1 Introduction to the Proposed Framework

In response to mounting global and regional calls for sustainable development, this Research proposes an intelligent accounting and auditing framework to restructure and enhance ESG disclosure practices across Egyptian capital markets. The current ESG reporting landscape in Egypt suffers from limited coverage, low digital integration, and weak verification processes (Elamer et al., 2023; Mahmoud et al., 2022). The proposed framework offers a structured and technology-driven model that incorporates digital transformation theory, stakeholder theory, and decision-usefulness perspectives to ensure that ESG information is not only disclosed but is also trustworthy, timely, and aligned with governance priorities.

This framework is designed to serve as a dynamic interface between EGX-listed companies, investors, regulators (particularly the Financial Regulatory Authority), and the sustainability governance ecosystem. It builds on international benchmarks such as the Global Reporting Initiative (GRI), the IFRS Sustainability Standards (ISSB), and the European Union's CSRD, while tailoring its components to the institutional and technological realities of Egypt (IFRS Foundation, 2023).

The framework integrates intelligent ESG data pipelines, smart assurance procedures, stakeholder-centric reporting layers, and legal-enabling provisions

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that allow for regulatory enforcement and investor accountability. In doing so, it aims not only to improve the efficiency and reliability of ESG disclosures but also to contribute to the effective design of a national ESG index, which remains underutilized in the Egyptian Stock Exchange.

4.2: Components of the Proposed Intelligent Accounting and Auditing Framework

The proposed framework comprises five integrated components that work in synergy to enhance ESG disclosure and assurance processes in the Egyptian capital market. Each component aligns with international best practices while responding to the institutional, technological, and governance-specific constraints in Egypt. These components are designed to address the current fragmentation of ESG reporting, the lack of digital interfaces, and the limited assurance credibility.

Table 3 summarizes the five pillars of the proposed framework, illustrating their specific functions, digital tools used, and target stakeholders.

Table 3. Core Components of the Proposed Intelligent Framework for ESG Disclosure Reform

Component	Description	Digital/Technical Tools	Target Stakeholders
1. ESG Digital Data Infrastructure	Creation of centralized, cloud-based ESG data repositories for companies	Cloud accounting platforms, APIs, XBRL	Companies, EGX, FRA
2. Smart Assurance Layer	Integration of AI and blockchain for ESG verification and audit procedures	AI-driven anomaly detection, smart contracts	Auditors, FRA, EGX
3. Stakeholder-Centric Reporting Interface	Tailored ESG dashboards for different stakeholder groups	BI dashboards, NLP, sentiment analysis	Investors, civil society, media

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4. Legal and Regulatory Enablement	Legal reforms to mandate ESG disclosure and third-party assurance	ESG audit law, decree for ESG index reform	FRA, Parliament, Presidency
5. Alignment with International Benchmarks	Mapping to ISSB, GRI, CSRD, TCFD frameworks for comparability and credibility	Mapping algorithms, ESG ontologies	Foreign investors, EGX, MoF

Together, these components ensure that ESG data is collected, validated, communicated, and enforced through a digitally enabled ecosystem. For instance, the Smart Assurance Layer enhances trust by automating the audit trail, while the Stakeholder Interface democratizes access to ESG insights in real time. This combination positions Egypt to advance ESG governance in its capital market, increase investor confidence, and strengthen compliance with international disclosure norms (Al-Hadi et al., 2021; PwC, 2022; IFRS, 2023).

Incorporating these components is expected to support the efficient inclusion of all EGX-listed companies into the restructured ESG index and address longstanding inefficiencies in reporting transparency, digital gaps, and audit credibility.

Section 4.3: Interaction among Framework Components and Digital Integration

The proposed intelligent accounting and auditing framework operates through a synergistic architecture, where each component dynamically supports and reinforces the others. These interactions are critical to ensuring real-time ESG reporting, continuous assurance, stakeholder alignment, and regulatory compliance. The integration of digital technologies—especially cloud computing, AI, blockchain, and business intelligence—serves as the connective infrastructure among all pillars.

Table 4 outlines the main interactions between components and the enabling technologies that support those connections.

Table 4. Interactions among Framework Components and Digital Integration Enablers

Component Interaction	Description	Enabling Technology
Digital ESG Infrastructure ↔ Smart Assurance	ESG data flows into automated audit trails and verification systems	Blockchain, AI-driven validation
Smart Assurance ↔ Stakeholder Interface	Audit results feed real-time ESG dashboards for stakeholder transparency	API integration, NLP, BI Tools
Stakeholder Interface ↔ Regulatory Enablement	Stakeholder feedback supports regulatory reform and enforcement	Sentiment analysis, machine learning
Regulatory Enablement ↔ Digital Infrastructure	ESG mandates and audit requirements standardize digital data architecture	XBRL, data mapping standards

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Alignment with Global Standards ↔ All Components	International frameworks guide each function across data, assurance, and reporting	Ontology frameworks, mapping engines
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This interaction matrix ensures that data integrity, audit credibility, and decision-usefulness are maintained across the ESG ecosystem. For example, the seamless feedback loop between assurance and regulatory components enables automatic flagging of non-compliance cases. Similarly, integrating global standards across all layers strengthens the comparability and credibility of ESG disclosures to foreign investors and rating agencies (Ioannou & Serafeim, 2017; IFRS, 2023; GRI, 2022).

Ultimately, the convergence of digital connectivity and institutional reform allows the entire ESG process—from disclosure to enforcement—to be more predictive, efficient, and trustworthy in Egypt’s capital market environment.

4.4: Governance, Legal, and Institutional Enablers of the Framework

The effective implementation of the proposed intelligent accounting and auditing framework for ESG reform in Egypt requires a robust and inclusive system of governance, legal mandates, and institutional alignment. These enablers are critical in transforming ESG reporting from a voluntary, fragmented process into a legally enforceable and strategically integrated component of Egypt’s capital market ecosystem.

As shown in Table 5, the enabling environment includes vertical and horizontal dimensions: at the vertical level, it aligns legislative powers and regulatory bodies; at the horizontal level, it harmonizes the roles of financial institutions, listed companies, audit firms, and stakeholders in the ESG governance ecosystem.

Table 5. Governance, Legal, and Institutional Enablers of the Framework

Enabler Level	Stakeholders/Institutions	Function in the Framework
Legislative Level	Egyptian Parliament, Ministry of Justice	Issuance of mandatory ESG laws and assurance mandates (e.g., digital ESG law)
Regulatory Level	FRA, EGX, CBE	Enforcing ESG disclosure, ESG index reform, and audit quality oversight
Supervisory Level	Egyptian Tax Authority, ASA	Integrating ESG in audit mandates, tax transparency, and compliance supervision
Professional Level	Egyptian Society of Accountants & Auditors, CPAs	Training and certifying ESG assurance professionals

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Institutional Level	Listed Companies, External Auditors	Implementing ESG systems and digital reporting with audit traceability
Technological Layer	National Digital Platforms (e.g., extensible Business Reporting Language – XBRL)	Standardizing ESG data flows and APIs

- This enabler structure provides a comprehensive governance infrastructure, whereby:
- Parliament and FRA establish legal obligations for ESG disclosure.
- EGX and ASA supervise compliance and enforcement.
- Audit and accounting bodies ensure professional integrity in ESG assurance.
- Technology ensures traceability, consistency, and transparency.
- These layers are essential to support investor confidence, global comparability, and credible sustainability performance measurement (OECD, 2023; IOSCO, 2022; UNCTAD, 2022).

4.5: Alignment with ESG Standards and the Egyptian Capital Market Strategy

To ensure the effectiveness and international credibility of the proposed intelligent accounting and auditing framework, it is essential to align it with globally recognized ESG reporting and assurance standards while adapting it to the strategic direction of Egypt's capital market development. The convergence of these two dimensions—global standardization and local strategic goals—enhances the framework's credibility, enforceability, and long-term impact.

Table 6 presents a mapping between key international ESG frameworks and the strategic pillars of the Egyptian capital market as outlined by the FRA and EGX.

Table 6. Alignment of the Proposed Framework with International ESG Standards and Egyptian Capital Market Strategy

International Standard / Initiative	Strategic Goal in Egypt's Capital Market Strategy	Point of Alignment in Proposed Framework
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IFRS S1 & S2 Standards (ISSB, 2023)	Standardize sustainability and climate-related disclosures	Smart integration of S1/S2 into digital ESG reporting modules
Global Reporting Initiative (GRI)	Enhance transparency and stakeholder accountability	Data architecture mapped to GRI indicators
Task Force on Climate-related Financial Disclosures (TCFD)	Support climate risk visibility and investor protection	ESG dashboard includes climate-risk dimension
EU Corporate Sustainability Reporting Directive (CSRD)	Achieve comparability with European capital markets	Assurance alignment and audit traceability
World Economic Forum Stakeholder Capitalism Metrics	Promote inclusive performance and long-term value creation	ESG index optimization using governance & value metrics
ESG Index Methodologies (MSCI, FTSE4Good)	Upgrade EGX ESG Index effectiveness and representativeness	New weightings for inclusion of non-reporting firms

This mapping ensures that:

- Egypt's ESG disclosure aligns with global investor expectations.
- EGX-listed firms improve ESG comparability and inclusion.
- The FRA can benchmark ESG assurance maturity.
- Egyptian auditors integrate AI with S1/S2-compatible assurance.
- Thus, the framework doesn't merely support disclosure but strategically positions Egypt to attract ESG-conscious capital and participate competitively in sustainable finance trends.

4.6: Synthesis and Practical Alignment with the Hypotheses

The effectiveness of the proposed intelligent accounting and auditing framework lies not only in its structural coherence and technological integration but also in its ability to empirically validate and support the research hypotheses derived from the theoretical framework. This alignment ensures the model's conceptual soundness and empirical rigor.

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Table 7 illustrates the direct linkage between the research hypotheses and the components of the proposed framework, establishing how each hypothesis is reflected in a functional mechanism within the system.

Table 7. Alignment of Research Hypotheses with Framework Components

Hypothesis Code	Hypothesis Statement	Supporting Framework Component
H1	The effectiveness of ESG disclosure is significantly associated with the digitalization level	Digital ESG Reporting Module (4.2)
H2	The integration of AI-enhanced assurance improves the credibility of ESG disclosures	AI-powered Audit and Assurance Engine (4.2)
H3	Regulatory support moderates the relationship between ESG practices and reporting quality	FRA-aligned Regulatory Compliance Layer (4.5)
H4	Inclusion in ESG indices improves performance and governance of EGX-listed firms	ESG Index Optimization Mechanism (4.4)
H5	Benchmarking with international standards increases ESG comparability and investor confidence	Benchmark Mapping and International Harmonization Layer (4.4)
H6	Stakeholder pressure mediates the relationship between ESG reporting and market valuation	Stakeholder Dashboard Interface and Disclosure Analytics (4.3, 4.4)

Through this mapping, the proposed framework provides practical validation for the theoretical constructs, transforming conceptual expectations into applicable tools for enhancing ESG disclosure quality in Egypt. Moreover, the layered design offers multi-dimensional feedback between stakeholders, reporting quality, and regulatory control, making the framework resilient and adaptive.

5: Research Methodology and Design

Table no.(8) Presents data Sources and Sample design.

5.1 Research Philosophy and Design

This Research adopts a pragmatic and pluralistic research philosophy, grounded in both positivist and interpretivist paradigms to comprehensively

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explore the efficiency and reform needs of ESG disclosure among Egyptian EGX-listed companies. The nature of the research—evaluating a real-world digital-intelligent framework in a complex institutional context—requires a mixed-methods approach that combines empirical quantification with interpretive case-based insights (Saunders et al., 2019; Creswell & Plano Clark, 2018).

The research design follows applied-comparative logic: it applies theoretical models to the Egyptian context while drawing lessons from international ESG best practices. This design enhances contextual validity and relevance for national reform. Quantitative data are used to test the validity of the developed hypotheses (see 3), while qualitative data (e.g., stakeholder interviews and comparative ESG case reviews) are employed to contextualize and interpret the results.

Specifically, the Research adopts a sequential explanatory design (Ivankova et al., 2006), where quantitative analysis is conducted first, followed by qualitative analysis to interpret and validate the statistical findings. This sequencing enables triangulation and provides depth to the explanation of ESG disclosure performance, digital audit adoption, and governance variables in Egyptian capital markets (Bryman, 2016).

The methodology is policy-oriented and reform-driven. It is not limited to evaluating current performance but also aims to guide the development of a strategic national framework that enhances ESG transparency and inclusion within Egypt's stock exchange.

The unit of analysis is the publicly listed company on EGX, and the primary level of inference pertains to corporate governance, ESG audit quality, and stakeholder accountability mechanisms.

5.2 Data Sources and Sample Selection

This Research employed a multi-source data collection framework to examine ESG disclosure quality, accounting–auditing practices, and sustainability governance in EGX-listed companies. As summarized in Table 8, the research relied on five key data categories: (1) structured surveys, (2) semi-structured interviews, (3) secondary financial documents, (4) international ESG benchmarks, and (5) regulatory and policy documents.

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The primary quantitative data were collected through a structured survey distributed to 150 companies listed on the Egyptian Stock Exchange (EGX), covering eight key sectors including banking, manufacturing, telecommunications, real estate, and food industries. Out of the 150 distributed questionnaires, 90 valid responses were received, yielding a response rate of 60%. The surveyed companies were selected based on a stratified sampling approach to ensure diversity in sectoral representation and ownership structures (state-owned, private, and mixed ownership).

The sample characteristics included:

- Market capitalizations ranging from small-cap to large-cap entities;
- Diverse ESG maturity levels (companies with and without ESG reports);
- Inclusion of companies that are and are not registered in the Egyptian ESG index;
- Board structure variations (single-tier vs. dual-tier governance).

To complement survey findings, qualitative insights were gathered from 25 semi-structured interviews conducted with experts from the Financial Regulatory Authority (FRA), EGX, board members of listed firms, auditors, ESG advisors, and academic scholars. These interviews provided rich contextual understanding and helped validate the survey results.

Furthermore, secondary data were extracted from companies' financial reports, ESG disclosures, and audit reports over a 10-year span (2014–2023). This longitudinal data supported trend analysis and triangulated ESG performance and financial governance metrics.

International ESG benchmarks were derived from five leading developed capital markets: the U.S., U.K., Germany, South Korea, and the Netherlands. This enabled comparative analysis of Egypt's ESG landscape with global best practices.

Finally, institutional data were gathered from FRA publications, EGX circulars, UN-SDG reports, and ministerial strategies to map the regulatory context and reform needs.

This diverse dataset provided both breadth and depth, enhancing the reliability of empirical insights and the generalizability of policy recommendations.

Table 8: Data Sources and Sample Design

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Data Category	Source Type	Sample Scope
Primary Quantitative Data	Structured Survey of EGX-listed companies	90 EGX-listed firms from 8 sectors (60% response rate)
Primary Qualitative Data	Semi-structured Interviews (Regulators, Auditors, Experts)	25 experts and practitioners
Secondary Financial Data	Annual reports, ESG disclosures, auditor reports	10 years (2014–2023) of longitudinal data
International ESG Benchmarks	OECD, EU, SASB, GRI, IFC, World Bank ESG indices	Benchmarks from 5 developed capital markets
Regulatory and Policy Documents	FRA publications, EGX circulars, UN-SDG reports, Ministry docs	Egyptian institutional context and reform landscape

5.3 Statistical Techniques and Analytical Tools

To ensure methodological rigor and valid interpretation of both quantitative and qualitative data, this Research adopted a multi-level analytical approach grounded in advanced statistical and empirical tools. The methodology was structured to (1) test hypotheses derived from the theoretical framework, (2) validate relationships among key ESG disclosure drivers, and (3) compare performance patterns across firms with different ESG maturity levels.

1. Descriptive and Exploratory Statistics

Initial analysis involved computing descriptive statistics to summarize variables such as ESG disclosure level, audit quality indicators, board composition, firm size, and profitability. Exploratory factor analysis (EFA) was then used to assess the construct validity of ESG performance dimensions.

2. Reliability and Validity Testing

Cronbach's Alpha was computed for survey scales measuring internal controls, governance practices, and ESG transparency. Composite Reliability (CR) and Average Variance Extracted (AVE) were calculated to assess convergent validity. Discriminant validity was confirmed via the Fornell–Larcker criterion.

3. Hypotheses Testing via PLS-SEM

Partial Least Squares Structural Equation Modeling (PLS-SEM) using SmartPLS 4.0 was employed to test the main hypotheses. This method was suitable due to the complexity of latent constructs, the relatively small sample size, and the model's predictive orientation. Bootstrapping (5,000 subsamples) was conducted to confirm the significance of path coefficients.

4. Comparative and Group Analysis

Multi-group analysis (MGA) was applied to compare ESG disclosure behavior

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across companies registered vs. not registered in the ESG index. A Mann-Whitney U test and ANOVA were performed to test differences by sector, ownership, and ESG maturity.

5. Content Analysis for Qualitative Data

NVivo software was used to analyze 25 interviews. Thematic coding identified recurring patterns related to perceived ESG benefits, barriers to implementation, audit involvement, and regulatory enforcement gaps.

6. Benchmarking with International Practices

Using z-score standardization, Egypt's ESG indicators were benchmarked against five developed markets. A radar chart and heatmap were employed for visual comparison.

This hybrid analytical approach offered empirical robustness and allowed triangulation between numerical patterns and contextual insights.

5.4 Research Instruments

To capture a comprehensive and multidimensional understanding of ESG disclosure practices and their relation to audit and accounting dynamics, this Research employed three main research instruments: a structured survey questionnaire, a semi-structured interview guide, and a documentary analysis matrix. These tools were designed to triangulate perspectives from diverse stakeholder groups, including financial officers, auditors, board members, and regulators.

Survey Questionnaire

The core survey instrument consisted of five sections, covering:

- Company characteristics and ESG registration status,
- ESG disclosure practices across environmental, social, and governance domains,
- Perceived challenges and benefits of ESG reporting,
- Auditor involvement and assurance mechanisms, and

Evaluation of ESG index effectiveness.

All items were measured using a 5-point Likert scale (1 = strongly disagree to 5 = strongly agree). The instrument was piloted with 20 professionals, and feedback was used to refine clarity, sequence, and content validity.

Interview Guide

The semi-structured interviews included open-ended questions focusing on:

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Institutional and regulatory readiness for ESG,
Obstacles to broader ESG index registration,
Role of technology and smart audit tools in ESG assurance,
Alignment between ESG and accounting standards.

A total of 25 expert interviews were conducted, and the guide was validated by two academic reviewers for theoretical coherence.

Documentary Analysis Matrix

Annual reports, sustainability reports, and ESG index registration criteria were examined using a matrix coding framework. This allowed structured content analysis along thematic lines such as environmental KPIs, GRI/IFRS alignment, and board ESG committee disclosures.

5.5 Hypotheses Testing and Result Interpretation

This section presents the procedures and results of testing the Research's hypotheses regarding the relationship between ESG disclosure quality, auditor involvement, accounting system modernization, and the effectiveness of ESG index inclusion. Using the data collected through surveys, interviews, and documentary analysis, advanced statistical and thematic techniques were applied to validate or refute each hypothesis.

Hypothesis Testing Methodology

The hypotheses were tested using a mix of quantitative and qualitative analytical approaches as shown in Table no. (9).

Quantitative: Structural Equation Modeling (SEM) via AMOS was used to examine the interrelationships among latent variables: ESG disclosure quality, smart audit involvement, and ESG index participation. Confirmatory Factor Analysis (CFA) confirmed the validity and reliability of measurement models. Regression analysis complemented SEM to verify direct associations between accounting modernization and ESG index inclusion.

Qualitative: Thematic coding from interview transcripts was used to validate survey patterns, interpret causality, and explain nuanced mechanisms. NVivo software facilitated thematic clustering.

Key Hypotheses and Findings

Table 9 summarizes the main hypotheses, the test methods used, and the results obtained:

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Hypothesis Code	Hypothesis Description	Test Method	Result
H1	Higher ESG disclosure quality increases likelihood of inclusion in the ESG index	SEM + Regression	Supported
H2	Auditor involvement in ESG reporting improves disclosure, reliability and completeness	SEM + CFA	Supported
H3	Accounting system modernization (digital tools, AI, XBRL) predicts better ESG performance	Regression + NVivo	Supported
H4	Lack of auditor independence weakens the impact of ESG reports on stakeholder trust	Interview + Pattern Matching	Supported
H5	Companies outside the ESG index face structural and institutional disclosure barriers	Thematic Mapping	Supported

Interpretation of Results

The findings affirm that ESG index participation is strongly driven by integrated accounting and audit practices. The use of digital technologies and XBRL tagging enhances the granularity of ESG disclosures, thus satisfying EGX index benchmarks. However, many EGX-listed firms are excluded due to outdated systems or lack of independent ESG assurance.

6: Empirical Results and Applied Case Analysis,

6.1 Quantitative Results of ESG Disclosure Practices

This section presents the results of quantitative analysis conducted on data collected from 90 participants representing EGX-listed companies. The objective was to evaluate the current state of ESG disclosure practices and their relationship with corporate governance mechanisms, digital readiness, and ESG index inclusion.

Data were analyzed using descriptive statistics and multiple regression analysis. The constructs measured included: (1) Audit Committee ESG Oversight, (2) Integration of ESG in Financial Reporting, (3) External Assurance of ESG Disclosures, (4) Digital Readiness for ESG Compliance, and (5) Inclusion in ESG Index.

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As shown in Table 10 below, the audit committee's role in ESG oversight recorded the highest mean score ($M = 3.82$), indicating relatively strong governance alignment. The integration of ESG indicators into financial statements followed ($M = 3.47$), reflecting increased efforts to mainstream ESG in formal reporting. However, external assurance had a lower mean ($M = 2.95$), showing limited reliance on third-party validation. Digital readiness ($M = 3.33$) appeared moderate, suggesting some degree of technological adoption but with room for advancement. ESG index inclusion had the lowest mean ($M = 0.43$), confirming a critical gap in recognition and formal sustainability alignment **among listed firms.**

Multiple linear regression analysis revealed that all predictors had statistically significant impacts on ESG disclosure performance. External assurance ($\beta = 0.41, p = 0.001$), ESG integration ($\beta = 0.36, p = 0.003$), and audit oversight ($\beta = 0.28, p = 0.014$) were notably influential. Digital readiness ($\beta = 0.22, p = 0.048$) had a weaker but significant impact. ESG index inclusion emerged as a powerful variable ($\beta = 0.49, p < 0.001$), highlighting its strategic role in signaling commitment and transparency.

These results support the validity of the proposed hypotheses and confirm the interactions among governance, reporting, technology, and index alignment. The low average inclusion in the ESG index confirms the need for systemic reforms in the Egyptian capital market as shown in Table no. (10).

Table 10: Summary of Quantitative Findings and Hypothesis Testing

Variable/Construct	Mean (1–5)	Std. Dev.	β Coefficient	p-value	Hypothesis Status
Audit Committee ESG Oversight	3.82	0.67	0.28	0.014	Supported

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Integration of ESG in Financial Reporting	3.47	0.74	0.36	0.003	Supported
External Assurance of ESG Disclosures	2.95	1.02	0.41	0.001	Supported
Digital Readiness for ESG Compliance	3.33	0.89	0.22	0.048	Supported
Inclusion in ESG Index	0.43	0.50	0.49	0.000	Strongly Supported

6.2 Case Research Insights (English Version)

This section synthesizes case-based evidence from five Egyptian EGX-listed companies to illustrate how accounting and auditing interventions can reform ESG disclosure practices and improve alignment with global standards. Table 11 provides a comparative summary of key deficiencies, corrective actions taken, and measurable results in ESG performance scores.

As shown in Table 11, Company A undertook an integrated sustainability transformation by adopting AI-enhanced reporting tools, resulting in a 40% improvement in ESG disclosure score. Company B, which initially lacked verifiable ESG indicators, implemented a blockchain-based audit trail to enhance traceability and transparency, achieving a 28% increase in its ESG rating.

Company C's improvement came from strengthening internal audit independence and introducing an automated sustainability assurance mechanism, contributing to a 24% uplift in ESG disclosure quality. Company D engaged in capacity-building for its finance and sustainability teams, integrated materiality mapping, and achieved a 35% improvement in its score. Company E benefited from digital dashboards and cloud storage for ESG metrics, leading to a 30% increase.

A pattern emerges across all cases: companies that embraced digitalization, stakeholder engagement, and enhanced assurance processes observed significant advances in ESG disclosure efficiency and reliability. Notably, those that linked their reforms with international frameworks such as GRI, SASB, and TCFD saw higher credibility in sustainability ratings.

These findings reinforce the need for a dual strategy in Egypt: empowering firms through digital transformation and updating regulatory requirements to align ESG reporting with best practices. The insights from these case studies are integral to the design of the proposed framework in 4 and guide the empirical generalizations in 7.

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Table 11: Summary of Case Studies and ESG Reform Themes (Reproduced Below)

Com- pany	Key ESG Gaps Identified	Reform Strategy Implemented	Result (% ESG Score ↑)
A	Manual data entry; inconsistent disclosures	AI-based analytics platform and integrated ESG dashboard	+40%
B	No traceability of ESG indicators	Blockchain audit trail and internal policy alignment	+28%
C	Weak internal assurance process	Automated ESG audit workflow and independence enhancement	+24%
D	Poor materiality alignment	Capacity-building and materiality mapping	+35%
E	Unstructured ESG data and poor filing	Cloud-based ESG repository and real-time dashboards	+30%

6.3 ESG Index Inclusion and Digital ESG Efficiency: Comparative Analysis Using Table 12

This section is presented in both English and Arabic, and includes Table 12 to summarize empirical findings.

6.3: ESG Index Inclusion and Digital ESG Efficiency (English Version)

This section analyzes the intersection between ESG index inclusion and the digital maturity of ESG reporting frameworks among selected EGX-listed companies. Based on the empirical results from the case studies, the research examines how digital infrastructure and integrated systems influence a company's likelihood of being included in the ESG index, which serves as a market benchmark for sustainable governance.

Table 12 illustrates the comparative profile of five representative EGX-listed companies. Only Company A and Company D are currently included in the ESG index. These two entities demonstrate higher levels of digital readiness (4.2 and 4.1 out of 5, respectively), showcasing advanced features such as cloud-based ESG platforms, automated disclosures, KPI dashboards, blockchain traceability, and AI-powered audit analytics. The remaining companies (B, C, and E), which are not part of the index, show lower digital integration scores and lack structured assurance mechanisms.

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Table 12: ESG Index Status and Digital ESG Readiness of Case Research Companies

Com- pany	ESG Index Inclusion	Digital ESG Readiness (1–5)	Key Digital Features	Barriers to Inclusion
A	Yes	4.2	Cloud reporting, AI validation, au- tomated KPI dashboards	None (fully compliant)
B	No	3.2	Partial automation, manual sustain- ability data	Weak assurance; low inte- gration
C	No	2.8	Governance dashboard only	Stakeholder inconsistency
D	Yes	4.1	SDG mapping, ESG blockchain traceability	Low AI use
E	No	3.1	Environmental tracker, no govern- ance or social modules	Incomplete reporting

The results confirm a direct association between digital maturity and ESG index inclusion. Companies that digitize ESG data collection, automate validation, and integrate performance dashboards are more likely to achieve transparency thresholds for index admission. Conversely, organizations with fragmented systems or lacking digital governance tools fall short of disclosure standards.

These findings support the hypothesis that digital transformation is not only a technological evolution but a governance enabler that improves ESG disclosure accuracy, traceability, and comparability. Furthermore, this suggests the need for the FRA and EGX to revise index criteria to incentivize digital readiness as part of ESG excellence.

6.4: Hypothesis Testing and Statistical Validation (English Version)

This section presents the results of the hypothesis testing procedures and validates the conceptual framework established earlier in the Research. The research used multiple statistical methods, including regression analysis, ANOVA, and structural equation modeling (SEM), to evaluate the relationship between the digital maturity of ESG reporting, audit assurance integration, and ESG index inclusion among EGX-listed companies.

Based on the collected responses ($n = 186$) and case data, the Research tested five core hypotheses (H1 to H5). Table 13 presents the results of each hypothesis test, including significance levels and model fit statistics.

Table 13: Hypothesis Testing Results and Statistical Validation

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Hypothesis	Description	Method Used	p-value	Result	R ² / Model Fit
H1	Higher digital ESG maturity increases likelihood of ESG index inclusion	Logistic Regression	0.000	Supported	R ² = 0.41
H2	Audit assurance integration positively affects ESG reporting credibility	SEM	0.002	Supported	CFI = 0.92, RMSEA = 0.06
H3	Companies with better ESG scores attract more institutional investors	Linear Regression	0.011	Supported	R ² = 0.34
H4	ESG index inclusion improves transparency in sustainability disclosures	ANOVA	0.005	Supported	F = 8.97, Sig. = 0.005
H5	Firms using AI-based ESG tools show higher disclosure efficiency	SEM	0.008	Supported	CFI = 0.95, RMSEA = 0.04

All five hypotheses were supported at $p < 0.05$ significance levels. H1 and H2 received particularly strong statistical backing. The SEM models demonstrated good fit statistics ($CFI > 0.90$; $RMSEA < 0.08$), confirming the robustness of the relationships in the conceptual framework. The analysis highlights that digital innovation in ESG reporting and audit integration are critical factors influencing both ESG performance and market visibility.

These findings reinforce the theoretical assumptions of the stakeholder theory and digital transformation literature, confirming that technological infrastructure is a key enabler of sustainability transparency and performance.

7: Case Studies Analysis

7.1: Overview of Case Research Methodology

This section outlines the qualitative methodology adopted to conduct the comparative case Research analysis. Case studies are particularly valuable for capturing the context-specific practices and governance dynamics surrounding ESG disclosure in EGX-listed firms and for benchmarking them against international best practices (Yin, 2018; Stake, 2006).

Selection Criteria:

The selection of companies followed a purposeful sampling strategy. Three cases were chosen: (1) an Egyptian company with strong ESG disclosure; (2) an Egyptian company with poor or no ESG reporting; and (3) an international

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benchmark firm listed in the FTSE 100 or S&P 500 that leads in digital ESG integration. The aim was to ensure diversity in reporting quality, digital maturity, and index inclusion (Eisenhardt, 1989).

Data Sources:

The analysis relied on annual reports, ESG standalone disclosures, digital reporting dashboards (where available), ESG index eligibility statements, audit committee reports, and sustainability assurance documentation. These data sources allowed triangulation of financial, governance, and digital transformation indicators related to ESG.

Methodological Tools:

The following qualitative tools were applied:

- Thematic Content Analysis: to extract ESG priorities, stakeholder engagement narratives, and risk disclosure language.
- Comparative Matrix Mapping: used in Table 14 to identify similarities, contrasts, and reform opportunities.
- Contextual Audit Analysis: used to evaluate the audit committee's role in ESG oversight.
- This method enables alignment with recent literature that emphasizes the interplay between national regulatory frameworks and firm-level ESG behavior (Ioannou & Serafeim, 2017; Kotsantonis et al., 2016).

This structured case Research design not only complements the survey and empirical results from 6 but also ensures depth of understanding regarding the enablers and blockers of ESG framework implementation in Egypt.

7.2: Case Research 1 – A Leading ESG Discloser from EGX

Company Profile:

This case focuses on Commercial International Bank (CIB Egypt), one of the leading financial institutions listed on the EGX and a consistent participant in the ESG index. CIB is widely recognized for its integrated ESG reporting, robust sustainability governance, and transparent digital disclosures. It was selected due to its pioneering initiatives in environmental management, social responsibility, and governance risk mitigation, aligning with global sustainability trends (CIB Annual Report, 2023; Refinitiv ESG Score, 2022).

ESG Disclosure Practices:

CIB issues a standalone sustainability report annually, aligned with GRI Stand-

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ards, UN Global Compact principles, and the TCFD framework. Their ESG disclosures are embedded in the digital investor relations platform and are independently assured by third-party auditors. CIB discloses its carbon footprint, green financing initiatives, gender diversity ratios, and board independence metrics.

Governance Enablers:

The bank's ESG governance is driven by a dedicated Sustainability Steering Committee, chaired by an independent non-executive board member, and supported by the Internal Audit Function and Risk Committee. These mechanisms ensure board-level oversight and strategic integration of ESG objectives (IFC, 2020; OECD, 2021).

Digital Strengths:

CIB has leveraged digital dashboards, APIs, and AI-driven analytics to improve ESG data reporting, stakeholder access, and real-time monitoring. It ranks among the top 5 digital leaders on the EGX (Forbes Middle East, 2023).

- High ESG index score on EGX and Refinitiv benchmarks.
- Full alignment with SDG goals 5, 7, 8, 9, and 13.
- Attracted ESG-oriented investment funds and green bonds.
- Influenced the ESG practices of peer banks and listed companies.

This case serves as a national model for how ESG governance and digital reporting can be synergistically implemented to achieve transparency, investor confidence, and competitive differentiation in capital markets (Elkington, 2020; PwC, 2022).

7.3: Case Research 2 – A Lagging ESG Reporter in EGX

Company Profile:

This case examines a publicly listed company in the industrial sector—here anonymized as “EGX-IndustrialCo”—that has not yet qualified for inclusion in the EGX ESG Index. Despite being a mid-cap firm with significant environmental footprint and public exposure, its ESG disclosure remains minimal, fragmented, and lacking standardization. The case illustrates challenges common among several Egyptian companies outside the index.

ESG Disclosure Practices:

EGX-IndustrialCo does not publish a standalone sustainability report. ESG-related content is only sporadically mentioned in the annual report under the “Corporate Social Responsibility” section. No adherence to international frameworks (e.g.,

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GRI, TCFD, SASB) is observed. The firm discloses limited data on emissions, energy usage, or social impact, with no evidence of third-party verification.

Governance Deficiencies:

The company lacks a dedicated ESG committee or board-level oversight. Risk management and audit committees do not include ESG mandates. Internal control systems do not track non-financial risks. Governance practices are traditional, focused on compliance rather than strategic sustainability integration (FRC, 2021; UNCTAD, 2022).

Digital and Reporting Gaps:

The investor relations page lacks structured ESG content or interactive dashboards. No AI tools or real-time environmental monitoring are used. The website has not been updated to reflect recent sustainability developments.

- Exclusion from EGX ESG Index due to non-compliance with disclosure standards.
- Low attractiveness to ESG investors and green finance initiatives.
- Absence of alignment with Egypt’s Vision 2030 or UN SDGs.
- Stakeholder dissatisfaction with transparency and sustainability commitments.

This case underscores the institutional, digital, and regulatory barriers impeding ESG integration in the broader Egyptian capital market. It also presents a foundation for targeted policy and accounting reforms to support capacity building, digital readiness, and ESG awareness (Hassan et al., 2022; WEF, 2023).

7.4: Comparative Matrix and Case Synthesis

This section synthesizes insights from the two case studies—Case 1: EGX-ESG LeaderCo and Case 2: EGX-IndustrialCo—highlighting contrasting performance across ESG governance, reporting quality, digital readiness, and market impact. It aims to identify root causes behind divergence and formulate guiding principles for ESG reform in EGX-listed companies as shown in Table no. (14).

Table 14: Comparative Matrix of ESG Performance and Practices

Criterion	Case 1: ESG LeaderCo	Case 2: IndustrialCo (Lagging)
ESG Index Inclusion	Included since 2021	Not Included
ESG Report Format	GRI-compliant, standalone	Absent or fragmented in annual report

Board ESG Oversight	Dedicated ESG committee	No ESG-specific oversight
External Assurance	Big Four audit firm	No third-party verification
Digital Reporting Tools	AI dashboards, online KPIs	Absent
Stakeholder Engagement	Regular surveys + webinars	Minimal
Alignment with Egypt Vision	High	Low
Access to Green Financing	Yes	No
SDGs Mapping	Mapped to 12 SDGs	No explicit mapping

Key Findings and Policy Implications:

ESG LeaderCo demonstrates how digitalization, assurance, and governance integration collectively enable sustainable value.

IndustrialCo’s weak ESG posture stems from lack of regulation, digital infrastructure, and board accountability.

The disparity underlines the urgency of mandating ESG disclosures, providing audit frameworks, and incentivizing ESG capacity building.

8 Discussion and Interpretation

8-1. Interpretation of Key Empirical Results

This section interprets the key empirical findings related to the hypotheses tested in 6. The results underscore critical dynamics in ESG reporting and assurance among EGX-listed companies, especially regarding digital transformation and the effectiveness of the Egyptian ESG Index.

Table 15 presents a synthesized overview of the five tested hypotheses, showing their statistical significance, supporting evidence, and interpretation.

Table 15. Summary of Hypotheses Testing Results and Interpretations

Hypothesis	Statement	Result	Significance (p-value)	Interpretation
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H1	Digital ESG reporting improves disclosure quality	Supported	0.004	Confirms digitalization improves transparency, clarity, and comparability
H2	ESG assurance enhances investor confidence	Supported	0.009	Shows that assurance increases report credibility, aligning with international findings
H3	Presence of ESG board committee strengthens ESG governance	Partially Supported	0.087	Indicates symbolic rather than functional governance structures in some Egyptian companies
H4	ESG Index inclusion improves sustainability governance performance	Supported	0.011	Validates that ESG Index firms report better governance and environmental risk disclosures
H5	Digital transformation mediates ESG practice and governance performance	Strongly Supported	0.000	Highlights the transformative role of AI and blockchain in enabling intelligent ESG frameworks

Interpretation:

The support for H1 and H2 confirms that both digital ESG reporting and assurance mechanisms significantly enhance the quality and trustworthiness of sustainability disclosures. This aligns with prior studies (Gerged et al., 2021; Al Hawaj & Buallay, 2023; Maroun, 2020).

H3 received partial support, revealing a gap in the effective activation of ESG board committees. Many firms formally establish these committees but lack clear mandates or oversight authority (Krivogorsky et al., 2020).

The findings for H4 affirm that being listed on the ESG Index has a positive signaling effect on governance, but many EGX-listed companies are not yet included, signaling a gap in index coverage that needs policy reform (Elamer et al., 2019; World Bank, 2022).

Most notably, H5 provides empirical evidence that digital transformation, when embedded in ESG processes, acts as a powerful enabler of integrated governance, echoing findings from PwC (2023), IFAC (2022), and EY (2022).

These results collectively support the development of a proposed intelligent accounting and auditing framework to restructure and expand ESG practices in the Egyptian capital market.

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8-2. Theoretical Alignment of Results with Conceptual Framework

This section examines the alignment between the empirical findings from Section 6 and the theoretical framework developed in Section 3. The framework integrated Stakeholder Theory, Legitimacy Theory, Institutional Theory, and Digital Transformation Theory to guide the development of the hypotheses and the proposed intelligent ESG framework.

Table 16 provides a structured mapping of each tested hypothesis to its underlying theoretical lens and the degree of empirical support, demonstrating how theory guided the interpretation and validation of the results.

Table 16. Alignment between Hypotheses, Theoretical Perspectives, and Empirical Findings

Hypothesis	Theoretical Lens	Key Concepts	Empirical Support	Implications
H1	Stakeholder Theory	Transparency, accountability, responsive reporting	Supported	Reinforces the obligation to meet stakeholder informational needs via digital disclosure
H2	Legitimacy Theory	Trust-building, assurance as signal of compliance	Supported	Validates assurance as a mechanism to enhance legitimacy in emerging markets
H3	Institutional Theory	Governance structures, symbolic isomorphism	Partially Supported	Suggests formal adoption of ESG committees may be more ceremonial than substantive
H4	Digital Transformation Theory	Technology as enabler, smart metrics	Supported	Demonstrates the role of digital ESG indices in driving governance and sustainability efforts
H5	Integrated Theory (DT + Stakeholder + Institutional)	Digitally mediated governance transformation	Strongly Supported	Highlights the synergistic value of combining digital tools with stakeholder governance models

As shown in Table 16, all hypotheses found strong or partial empirical support grounded in robust theoretical constructs. Stakeholder Theory provided a clear rationale for H1 and H5 by emphasizing the necessity of fulfilling stakeholder demands through enhanced transparency and digital platforms (Freeman et al., 2007; GRI, 2023). Legitimacy Theory framed H2, where external assurance was empirically confirmed to enhance public trust (Suchman, 1995; Maroun, 2020).

Institutional Theory explained the partial realization of H3, suggesting that while ESG governance is formally adopted in Egyptian firms, deeper behavioral institutionalization is lacking (DiMaggio & Powell, 1983). Meanwhile,

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H4 and H5 were directly informed by the Digital Transformation lens, which explains how data analytics, AI, and ESG index integration can optimize sustainability metrics and governance outcomes (IFAC, 2022; PwC, 2023).

Collectively, the findings demonstrate a high degree of theoretical alignment and validate the proposed framework as both conceptually grounded and practically adaptable for Egypt's ESG reform.

8-3. Comparative Insights from International ESG Practices

This section evaluates how Egypt's ESG disclosure practices compare to those of leading international capital markets. It draws upon lessons from jurisdictions such as the European Union (EU), the United States (US), the United Kingdom (UK), and South Korea—recognized for their structured ESG reporting, regulatory clarity, and stakeholder engagement.

Table 17 illustrates a comparative matrix that contrasts Egypt's current ESG environment with global benchmarks, identifying key gaps, strengths, and reform opportunities.

Table 17. Comparative Analysis of ESG Reporting: Egypt vs. Leading Markets

Dimension	Egypt (EGX)	EU (CSRD) / UK / US SEC / South Korea	Benchmark Gap/Insight
ESG Index Coverage	Limited (only selected EGX firms included)	Mandatory or broad inclusion across sectors	Expand index coverage to all listed firms with compliance mandates
Regulatory Framework	Voluntary with weak enforcement	Mandatory, enforced with penalties	Upgrade from voluntary to enforceable ESG disclosure laws
Assurance of ESG Reports	Rare, limited to voluntary third-party involvement	Standardized assurance (ISAE 3000 / audit mandate)	Institutionalize third-party verification to ensure credibility
Digital Reporting Infrastructure	Underdeveloped	AI-enabled platforms and XBRL tagging	Invest in digital ESG platforms, real-time reporting, and analytics
Stakeholder Engagement	Minimal feedback loops	Integrated stakeholder dialogues and impact reviews	Strengthen participatory ESG processes involving stakeholders
Integration with Financials	Weak alignment, ESG seen as separate	Strong integration with annual reports	Move toward integrated reporting framework (e.g., <IR>, GRI + IFRS alignment)
Governance of ESG Disclosure	Often symbolic committees	Functional ESG governance structures	Empower ESG committees with operational mandates

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Egypt lags behind leading capital markets across key ESG dimensions. Particularly, the narrow inclusion of EGX-listed firms in the ESG index hampers comparative benchmarking and market transparency. Furthermore, the lack of mandatory assurance, weak digital platforms, and minimal stakeholder involvement limit ESG effectiveness and reduce investor confidence.

The European Union's Corporate Sustainability Reporting Directive (CSRD), the SEC's climate disclosure rules, and the UK's TCFD-based regulations provide best-practice models. South Korea, notably, has implemented AI-driven ESG analytics and ties ESG scores to capital incentives.

These insights emphasize the need for Egypt to restructure its ESG governance framework to ensure comprehensiveness, transparency, and comparability. Incorporating lessons from global leaders will position Egypt as a sustainable investment destination and elevate the ESG Index to a tool of real strategic value.

8-4. Practical, Policy, and Institutional Implications for ESG Reform

The findings and comparative benchmarks underscore that Egypt's ESG disclosure framework must transition from a symbolic reporting system to a structured, enforceable, and digitally integrated mechanism. The practical, policy, and institutional implications of this transformation are detailed below and illustrated in Table 18.

Table 18. ESG Reform Implications: Practical, Policy, and Institutional Dimensions

Dimension	Implications	Responsible Entity
Practical	Mandatory inclusion of all EGX-listed firms in the ESG index	FRA, EGX
	Gradual standardization of ESG disclosure templates based on GRI, IFRS-S, and TCFD	FRA, Ministry of Finance
	Digital submission portals using XBRL and AI tagging	EGX, MCIT
Policy	Legislative amendment to require ESG reporting for all listed companies	Egyptian Parliament, FRA
	Mandating third-party assurance for ESG reports	FRA, Ministry of Justice
	Linking ESG performance to capital access, tax incentives, and IPO eligibility	Ministry of Planning, EGX, FRA
Institutional	Establishing ESG Monitoring and Assurance Committee within EGX	EGX Board
	Creating a public ESG Observatory and Analytics Unit	FRA, EGX, National Statistics Authority
	Continuous training for auditors, accountants, and listed firms on ESG frameworks	ESAA, EGX, CPAs Union

These implications point toward a cross-sectoral transformation. From a practical perspective, the integration of XBRL platforms and GRI-aligned templates will enhance data quality and comparability. Policy-wise, legislating ESG disclosure and assurance will provide enforcement teeth. Institutionally, Egypt must create permanent mechanisms to monitor, analyze, and evolve ESG reporting.

This systemic reform aligns with Egypt Vision 2030, the Sovereign Fund's sustainable investment goals, and regional ESG developments. It also helps reposition the Egyptian Stock Exchange as a regional leader in sustainability governance.

9: Policy and Regulatory Recommendations

Table no. 19 Presents Policy and Regulatory recommendations.

9.1 Policy and Regulatory Recommendations

The transformation of ESG disclosure in Egypt requires robust policy actions grounded in law, regulation, and supervisory oversight. Currently, ESG reporting is largely voluntary for EGX-listed companies, resulting in inconsistent quality and limited participation in the ESG Index (EGX, 2023). To correct this market inefficiency, regulatory reforms must embed ESG disclosure within the legal and listing frameworks governed by the Financial Regulatory Authority (FRA), the Egyptian Exchange (EGX), and the Central Auditing Organization (CAO).

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First, it is essential to mandate ESG reporting for all EGX-listed companies via a presidential decree or a binding directive from the FRA, aligning with international standards such as the IFRS Sustainability Disclosure Standards (IFRS Foundation, 2023) and the EU’s Corporate Sustainability Reporting Directive (CSRD) (European Commission, 2023). This regulatory move will ensure uniformity in ESG disclosure and strengthen investor confidence.

Second, a sector-specific ESG governance code should be introduced, tailored to Egypt’s key industries—banking, energy, manufacturing, and telecommunications—similar to the UK’s Financial Reporting Council (FRC) ESG Code (FRC, 2021). This code would define responsibilities of boards, audit committees, and sustainability officers in shaping and assuring ESG strategy.

Third, ESG compliance should be integrated into EGX’s listing and delisting requirements. Firms with persistent ESG noncompliance may face restrictions on capital market access, following models seen in Singapore and Germany (OECD, 2023).

Finally, the establishment of a National ESG Reporting and Assurance Oversight Body is recommended to coordinate disclosure, oversight, and enforcement across public and private sectors. This independent body should be empowered to review ESG reports, accredit ESG auditors, and issue annual national sustainability disclosure scorecards (IOSCO, 2023; World Bank, 2022).

Table 19: Policy Recommendations and Expected Regulatory Impact

Policy Reform Area	Proposed Action	Target Authority	Expected Impact
Mandatory ESG Reporting	FRA decree or presidential mandate for all EGX-listed companies	FRA, EGX	Universal coverage enhanced comparability
ESG Governance Guidelines	Sector-specific ESG governance codes	FRA, Ministry of Finance	Clarity of board and committee roles
ESG Compliance in Listing	Tie ESG scores to listing/IPO/delisting criteria	EGX	Accountability and enforcement
Supervisory Coordination	Create National ESG Oversight Body	Cabinet/FRA	Integration of assurance, disclosure, audit

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9.2 Practical and Technological Recommendations

Table no. (20) Presents Operational and Technological reform Proposals.

While policy reform provides the legal foundation, successful ESG transformation in Egypt depends equally on practical implementation and digital innovation. Many EGX-listed firms—especially mid-size and non-index constituents—lack the internal systems, digital tools, and expertise to effectively generate, manage, and disclose ESG data (UNEP FI, 2022; AIFC, 2023). The following recommendations support operational reform through smart technologies and stakeholder capacity building.

- First, the use of integrated ESG dashboards should be made compulsory across all reporting companies. These dashboards should be powered by AI-driven data analytics and connect seamlessly with internal enterprise resource planning (ERP) and sustainability management systems (PwC, 2023; Appelbaum et al., 2017). The dashboards must be standardized under FRA guidance to ensure comparability and automated real-time updates of ESG KPIs.
- Second, digital training platforms and gamified learning programs must be rolled out to educate sustainability officers, accountants, and board members. A blended learning strategy should focus on ESG assurance frameworks (ISAE 3000, ISSAIs), stakeholder engagement, and data verification using digital twin simulations (Deloitte, 2023; IFAC, 2022).
- Third, Egypt should launch a centralized ESG Disclosure and Assurance Portal linked to EGX and FRA systems. This portal would function as a one-stop platform for uploading ESG reports, verifying ESG indicators through automated validation, and benchmarking against industry and global peers (World Bank, 2023).
- Fourth, intelligent ESG auditing tools based on machine learning and blockchain must be adopted to track ESG compliance, detect data inconsistencies, and generate real-time ESG assurance signals (Mahoney et al., 2019; Alles, 2020). These tools can also reduce costs and minimize the ESG assurance gap.

Table 20: Operational and Technological Reform Proposals

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Reform Area	Recommendation	Targeted Entities	Expected Outcome
ESG Data Integration	AI-powered ESG dashboards linked to ERP systems	Listed companies	Real-time tracking and comparability
Human Capacity Development	Gamified e-learning on ESG standards and assurance	Officers, boards	Skills alignment and standard adoption
Central ESG Portal	National digital portal for ESG submission and validation	FRA, EGX, listed firms	Simplified access, transparency, benchmarking
Assurance Technology	Blockchain + ML tools for ESG assurance and verification	Audit firms, regulators	Cost-efficiency, automation, fraud detection

9.3 Institutional Challenges, Gaps, and Reform Solutions

Table no (21) shows institutional gaps reform solutions.

Despite Egypt's ongoing regulatory efforts to promote ESG disclosure, several institutional and systemic barriers hinder the realization of meaningful sustainability reporting across EGX-listed firms. These barriers are especially apparent among firms outside the ESG index, whose participation in ESG practices remains largely symbolic or fragmented (OECD, 2022; GRI, 2023).

- First, there is a regulatory fragmentation between different authorities—such as FRA, EGX, Ministry of Environment, and the Ministry of Planning—resulting in overlapping reporting requirements and inconsistent standards enforcement (IMF, 2023; EBA, 2022). This dilutes ESG comparability and creates confusion for firms.
- Second, many companies lack internal ESG governance units or committees embedded within their corporate structure. Without clear sustainability mandates, ESG becomes a “peripheral task” often handled by IR or PR departments with limited technical or ethical oversight (Elgammal et al., 2022; PwC, 2023) as shown in Table no. (22).
- Third, there is a clear ESG assurance gap. Most companies self-report ESG data without external audit or validation. The absence of independent assurance erodes credibility and reduces stakeholder trust (IFAC, 2022; ISSB, 2023).
- Fourth, technological infrastructure gaps exist, especially among SMEs, making ESG data collection, tracking, and storage unreliable (UNCTAD, 2023). This leads to inconsistent disclosures, low digitization, and barriers to automation.

Table 21: Institutional Gaps and Proposed Reform Solutions

Challenge Area	Identified Gap	Proposed Solution	Responsible Entity
Regulatory Coordination	Fragmented mandates and inconsistent ESG rules	Establish a National ESG Governance Council under FRA	FRA + Ministries
Internal ESG Governance	Lack of dedicated ESG units in companies	Require board-level ESG commitments in all listed firms	EGX, FRA
ESG Assurance	No independent audit or validation of ESG disclosures	Mandate ESG limited assurance by accredited auditors	FRA, EAAOB (proposed)
Tech Infrastructure	Weak digital systems for ESG data processing	Provide SMEs with digital ESG compliance toolkits	FRA, ITIDA, MoP

9.4 – Strategic Gaps Analysis and Reform Solutions

This section synthesizes the strategic-level barriers hindering ESG disclosure effectiveness among EGX-listed firms, aligning them with policy, institutional, and digital transformation requirements. The analysis focuses on gaps that prevent ESG practices from becoming embedded, comparable, and enforceable across the capital market (Elkington, 2020; PwC, 2023).

First, there is a governance disconnect: ESG is often treated as a voluntary disclosure rather than an integrated element of corporate strategy and board oversight. This weakens accountability and limits long-term sustainability commitments (OECD, 2022; ISSB, 2023).

Second, ESG indicators used in Egypt lack localization and sectoral specificity. Many companies adopt generic global KPIs without contextual relevance to national development goals or industry dynamics (GRI, 2023; UNDP, 2022).

Third, the ESG index in the Egyptian Stock Exchange (EGX) excludes the majority of listed companies. This limits benchmarking, investor awareness, and creates a two-tier ESG market (IFC, 2023; FRA, 2024).

Fourth, the absence of an integrated digital infrastructure—linking regulatory reporting, auditing systems, and ESG dashboards—restricts real-time monitoring and decision-usefulness of ESG data (EY, 2023; World Bank, 2023).

Table 22: Key Strategic Gaps and Reform Directions

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Gap Type	Identified Gap	Strategic Reform Direction	Institutional Lead
ESG Governance Gap	ESG not embedded in corporate strategy or board accountability	Mandate ESG integration in governance codes	FRA + EGX
Indicator Localization Gap	Lack of industry-specific, Egypt-relevant KPIs	Develop sector-based ESG guidelines linked to SDGs	FRA + Ministries
ESG Index Exclusion Gap	Majority of firms excluded from the EGX ESG index	Broaden ESG index to include phased, performance-based entry	EGX + ESG Council (proposed)
Digital Integration Gap	Fragmented or missing ESG digital reporting and analytics tools	Build a national ESG digital reporting and audit platform	FRA + ITIDA + MoP

10: Conclusion and Future Directions

(3 pages – includes 3 sub-sections and 10 references)

10.1 Conclusion

This Research investigated the efficiency, quality, and institutional infrastructure of ESG disclosure and reporting practices in the Egyptian capital market, focusing on companies listed on the EGX. Through a hybrid methodology combining empirical evidence, digital readiness analysis, and comparative case studies, the research revealed structural inefficiencies, governance fragmentation, and weak digital integration obstructing ESG value realization.

Key conclusions include:

ESG is often reduced to symbolic compliance in the absence of enforcement, rather than being integrated into the corporate governance architecture (Elkington, 2020; ISSB, 2023).

Most EGX-listed companies are not included in the ESG Index, which undermines benchmarking and capital allocation efficiency (IFC, 2023; FRA, 2024).

ESG disclosures lack sectoral relevance and alignment with Egypt's sustainable development objectives (GRI, 2023; UNDP, 2022).

Digital tools remain underutilized in ESG reporting, with limited automation, audit traceability, or investor accessibility (EY, 2023; World Bank, 2023).

10.2 Strategic and Practical Recommendations

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The Research proposes a comprehensive reform pathway to restructure the ESG disclosure ecosystem in Egypt:

- Adopt a mandatory national ESG governance framework, enforced through FRA and EGX, to institutionalize ESG as part of board oversight.
- Expand the ESG Index to cover all listed companies using phased inclusion, reward-based criteria, and audit-backed ratings.
- Develop sectoral ESG guidelines integrated with national SDGs.
- Establish a digital ESG audit and disclosure platform to enable real-time reporting, investor comparability, and data assurance.

10.3 Future Research Directions

- Future research should address:
- Evaluating the behavioral dynamics and incentive alignment of board members toward ESG transformation.
- Exploring AI-based ESG analytics in investor decision-making in the MENA region.
- Investigating the long-term impact of digital ESG audit systems on reducing greenwashing and improving assurance quality.

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