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The Advancement of Environmental, Social, and Governance: Classification, Pros/cons Analysis, and AI Application

Jiahang Du

School of Social and Political Science, University of Edinburgh, Edinburgh, UK
samdu2002@foxmail.com

Abstract. Environmental Social and Governance has developed as a main focus for evaluating how organizations address sustainability and value development in conditions of global environmental and social issues. This work provides foundations and types of ESG across the three areas and shows how this approach extends analysis that focuses on financial measures. The work examines main benefits of using this approach and considers important difficulties. The analysis also examines how AI systems affect development of ESG in the future. These systems allow improvements in processing data and making predictions and supporting governance operations in ESG analysis but also produce new issues relating to use of energy, inequality and credibility. Overall this work suggests that ESG's effectiveness depends on finding balance between benefits that develop over time and difficulties in actual use and responsible application of developing technologies.

Keywords: Environmental Social and Governance (ESG), classification, advantages, disadvantages, AI application

1. Introduction

ESG(Environmental Social and Governance) indicates a group of measures for organization operations that individuals use to evaluate how an organization manages issues and possibilities relating to protection of the environment and responsibility in social areas and practices in governance. As a term that developed recently, ESG has shown increased prevalence over the previous decades. Following major global occurrences such as changes in climate conditions, society has moved focus to sustainable development and this produces greater awareness of ESG among organizations.

Over the previous decades, ESG has received greater focus in academic work and in industry. This pattern can be traced back to the 1990s when "the explosive surge in globalization at the end of the twentieth century was accompanied by gaps in global rule-making on labor standards, human rights, and environmental protection—in turn feeding fears that a backlash against globalization might grow." [1]. As a result, large organizations developed practices that incorporated a group of core values in these areas into statements of mission and operations of the organization.

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Global warming, a recent environmental problem that has drawn the majority of public attention, has provided further evidence for these precautions. According to the Intergovernmental Panel on Climate Change (IPCC) in 2018, global average temperatures are about 1 ℃ higher than pre-industrial levels. IPCC warned that "continued increases in emissions could ultimately result in irreversible long-term disruptive consequences for the planet." [2] At a corporate level, such climate change could result in not only increased physical and transition risks, but also decreased social responsibility and preference from investors. Hence, a regulatory framework that adopts ESG is proven to be pressing.

ESG is crucial to evaluating companies' financial decision-making, internal governance, and future management. This work discusses ESG in a particular approach. The classification that follows provides a description that establishes the meaning of ESG and presents how it divides into different dimensions, themes, and key issues. The work then examines the advantages that ESG provides and considers the challenges that it could encounter. The final part uses an AI case discussion to show more about ESG's future development.

2. The classification of ESG

ESG contains three main dimensions that relate to Environmental, Social, and Governance factors, and these dimensions provide themes that relate to key issues. The classification of ESG is concluded in Figure 1 below.

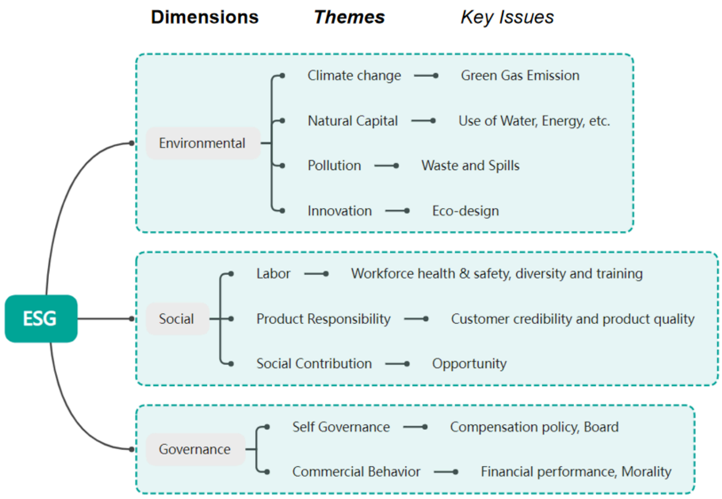

Figure 1. Brief classification of ESG

The Figure indicates that ESG involves three main dimensions. The dimensions include environmental factors, social factors, and governance factors. Each dimension that the analysis examines contains themes that differ in focus, and these themes relate to issues that function as key measures. The key issues that the analysis considers often use indices that allow specific ESG analysis, and this allows the issues to appear in forms that support measurement. This section describes the key issues and presents the indices that correspond to these issues that ESG analysis uses.

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2.1. Environmental

The environmental dimension examines a company's impact on the natural world. It contains four themes that present different aspects including emissions, use of natural capital, pollution and waste, and innovation.

Emissions, especially carbon emissions, are the main issue in this theme. It includes four major parts: the company's carbon emissions, the carbon footprint of its products, investment in environmental protection, and its contribution to climate change vulnerability.

The natural capital theme considers use and preservation of natural resources, and water is the main resource that it examines. The consideration includes the company's purchase of raw materials and its impact on natural resources, such as water and biodiversity.

Pollution represents a company's negative impact on the natural world. This theme focuses on toxic emissions and waste that the company produces. The key issues include e-waste, packaging materials, and collateral waste. The Company's policies for controlling and reducing waste are crucial to this theme.

Innovation is the theme that comprises efforts to improve sustainability. Issues that this area considers include development of clean technology, construction that uses green approaches, and energy from renewable sources.

2.2. Social

The social dimension shows how a company provides value beyond economic measures. This dimension examines factors that indicate responsible practice toward people and society. Three main areas appear in this dimension: labor, product responsibility, and social contribution.

Labor represents a major focus in the social dimension. This theme examines how the company treats individuals in the workforce. The key issues include workforce health, safety, and diversity. Other issues that relate to labor appear in company supply chain's labor standards and in workforce development - in other words, systematic training of employees' knowledge and skills.

Product responsibility focuses on the customer. The basics are product safety and product quality, especially for chemical products or financial products. The theme also considers customer credibility, including privacy and data security.

The third theme, Social Contribution, refers to the company's overall contribution to society. It represents all the development and employment opportunities the company offers to society across various industries.

2.3. Governance

The governance dimension comprises the governance aspect of ESG standards. This policy-related pillar encompasses not only internal governance but also foreign policy and can thus be divided into two themes: self-governance and commercial behavior.

Self-governance is based on the company's inner structure. It often considers the board constitution, the allocation of proprietary rights, the management compensation policy, accounting standards, and anti-corruption measures.

Commercial behavior is the set of all the company's external strategies. The strategies can be exemplified by tax transparency, information disclosure, and antitrust policy.

From the descriptions above, it is clear that ESG covers various areas in enterprise management. In contrast to traditional investing, which focuses primarily on financial performance and economic

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values, ESG emphasizes sustainability, social responsibility, and governance stability. The next section will discuss ESG's advantages and potential challenges, providing a fuller understanding of its current position in social contexts.

3. ESG: advantages and challenges

The classification provides a general description of ESG. However, as a concept deeply embedded in financial strategies, the essence of ESG requires further examination. This analysis examines the advantages and possible challenges that ESG presents. From both external and internal perspectives, the positive features and limitations of ESG can be clearly demonstrated.

3.1. The advantages of ESG

Companies that use ESG practices show benefits in external and internal contexts. The external benefits include features relating to sustainability, legal intervention, and brand value.

(1) From the external side, improvement of financial performance is a crucial part of companies' indicators. Sustainability is a key concept in the ESG framework. When companies practice ESG's sustainable standards, they increase their external competitive advantage and attract more customers [3]. Furthermore, by comprehensively managing their supply chains, companies can significantly improve financial performance.

Legal intervention is a subtle yet crucial consideration for companies. As a standard that meets legal requirements, ESG can help the company secure government support. Furthermore, adopting ESG could indeed enable companies to gain greater strategic freedom through deregulation [3].

Brand value, in other words, reputation, is a factor that could support the company in many potential ways. ESG fosters a strong customer community and government relations, which, for companies, means better access to customers, resources, and talent [3].

(2) The internal advantages of ESG include cost reduction, employee satisfaction, and risk mitigation. Cost reduction is a rather straightforward benefit of ESG. At the basics, ESG's efficient resource-use standards result in lower energy costs. Also, providing capital for the long term and preventing investments that show losses from environmental issues over time [3] can improve the company's financial performance in substantial ways.

Employee Satisfaction relates mainly to the Governance dimension of ESG. With a standardized, equal distribution of power and payment, a company can create positive motivations that increase effort, which increases productive output [3].

Risk Resistance represents a major characteristic of ESG that also relates to company survival [4]. In the internal context, using ESG can provide support for the company to address problems relating to internal corruption. In the external context, increased ability to recognize social risks allows companies to prevent investments that might not provide returns. In both contexts, using ESG represents an important factor for sustainability, not just for the environment, but for the company as well.

3.2. The challenges of ESG

Although ESG offers numerous advantages, current social contexts pose challenges that may explain why it is not yet practiced globally. The challenges appear both outside and inside the organization. The external challenges include differences between standards, difficulties with management, and pressure relating to disclosure of information.

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(1) From the external side of the organization, ESG, although adopted and practiced in various regions, does not have a unified standard [5]. This absence of unified standard prevents organizations in different regions from establishing consistent compliance in a globalized context. The low comparability that results from different standards also prevents analysis and assessment of the ESG system.

Difficulties with management create additional problems for organizations that attempt to adopt ESG practices. While the aforementioned management standards matter, companies struggle to quantify and fully regulate compliance. As technical challenges arise, traditional companies particularly struggle to meet ESG technical requirements.

The third external challenge of ESG results from disclosure of information. Stakeholders tend to show varying and increasing requirements for disclosure. ESG functions as a standard that controls various aspects of the organization, and it typically requires substantial disclosure. Organizations, particularly organizations that are not listed, show reluctance to disclose large amounts of information that is specific to the organization. This reluctance functions as an obvious prevention of ESG's practice.

(2) The challenges of ESG do not only result from external factors. Internal factors also prevent ESG from being practiced globally. The factors can be described as differences in understanding, short-term financial pressure, and staffing limitations.

The first internal challenge is differences in understanding. It exists in forms of understanding of ESG that are not consistent across different departments within the organization, and this creates additional problems for internal promotion of ESG. For example, the public service department would have no problem promoting ESG and disclosing its positive contributions, such as disability employment and philanthropy. However, the financial department might not be willing to expose the obscure financial details.

Short-term financial pressure is another problem that various organizations experience when adopting ESG. The ESG vision for long term is beneficial for organizations, but the returns require time to appear. In the period of waiting, the practice of ESG could create significant short term financial pressure for organizations. Various organizations might not be able to operate before they can work toward the long term sustainability that ESG supports. In fact, these inconsistent relationships between ESG and companies' financial performance are evident in recent empirical studies [4,6]. Some research shows that ESG could entail short-term costs, reducing the likelihood of guaranteed profit.

Staffing limitations present issues that any new approach would need to address. ESG is a relatively new area with most staff coming from other subjects, such as environmental science. The limited number of individuals who understand the main structure and the overall form that ESG follows makes efforts to develop ESG difficult in important ways.

4. AI in future ESG: advancement or challenge

In recent years, artificial intelligence has developed dramatically. Driven by the exponential growth of data availability and advances in computational power, AI has demonstrated strong capabilities in prediction, classification, optimization, and automated decision support, further illustrating its promising future. In this context, the development of ESG in the future is inseparable from artificial intelligence. The rapid advancement of artificial intelligence serves as both a catalyst for ESG implementation and a source of new obstacles. This section further explores AI's impact on ESG across the environmental, social, and governance dimensions.

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4.1. AI in environmental

On the one hand, the use of AI provides important means for environmental protection. AI models show greater efficiency and accuracy than manual approaches in processing and analyzing large data volumes, and this allows easier identification of current environmental issues and prediction of issues that may occur. In fact, AI implementations such as machine learning algorithms and computer vision methods are already widespread across many industries [7]. By accessing satellite images and identifying them using computer vision, AI can provide efficient, precise analysis of many environmental indices, such as carbon dioxide absorption capabilities [7].

On the other hand, the use of AI also presents environmental issues. Training AI models and operating these models require substantial power. For example, "training a state-of-the-art GPT-3 NLP (Natural Language Processing) network requires almost 936 MWh - the same amount of power as 468,000 average electric kettles (2 kWh) or 12,480 lithium-ion Tesla car batteries (75 kWh) [7]." The carbon footprint that AI models produce can result in increased environmental vulnerability. Moreover, the computational requirements of machine learning often involve the use of toxic materials, further increasing the pressure on and risk to the environment. The ecological effect of power consumption in AI should receive careful consideration before using AI in ESG analysis.

4.2. AI in social

The use of AI in analysis of social factors provides significant value. AI shows features including flexibility, precision, and speed that allow AI's application across different contexts. In detail, AI models can provide predictive maintenance for critical infrastructure to prevent risks. These models also allow management of supply chains in a manner that follows standards for ESG, increasing transparency [8]. In addition, AI advances work in medical care through improving disease diagnostics and treatment planning [7], etc.

However, AI does not show universal suitability for evaluation of ESG when considering social aspects. AI represents a method that requires advanced level technology and substantial investment. The extent to which AI is affordable shows considerable variation across different countries, regions, and industries. This difference would increase inequality to a greater degree, given that use of AI is an important element of competitive advantage for organizations. The difference also indicates that examination of ethics and responsibility relating to AI requires a comprehensive approach, since algorithms may show regional or cultural bias. In conclusion, the considerable benefits that AI could provide for evaluation of ESG are clear, but the problems of inequality and ethics that are associated with AI require full consideration before implementation occurs.

4.3. AI in governance

On the one hand, AI is invaluable for corporate governance at both macro and micro levels. At the macro level, advanced AI models predict market trends, support decision-making, and analyze unstructured ESG disclosures. At the micro level, AI systems "automate routine tasks such as checking document consistency, generating reports according to preset templates, implementing search engines, establishing knowledge bases, and supporting chatbots to assist employees [7]." By utilizing AI, companies can significantly improve management efficiency and accuracy.

On the other hand, AI presents issues in governance that are closely tied to its credibility. Complex "black-boxed" AI algorithms generate outcomes without providing the deduction procedure. This feature of AI affects the degree to which organizations can examine how decisions

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occur and can establish responsibility for decisions. As a result, it creates difficulties for practices that require transparency in decisions regarding investment [8]. Organizations seeking to establish confidence in AI require approaches that provide governance for the AI procedures and confirm the data accuracy.

AI plays a dual role in advancing ESG. It undoubtedly accelerates ESG development by providing convenient computing tools for accurate quantification, consistent regulation, comprehensive analysis, risk prevention, and management improvement. However, AI also creates obstacles that organizations observe in practice. However, AI also introduces many practical challenges, including environmental vulnerability, inequality, ethical and responsibility issues, and difficulties in establishing accountability for outcomes. AI shows considerable potential for ESG development, but the approach still requires significant evaluation before practical realization.

5. Conclusion

This paper examines the definition and future of ESG. It first discusses the origins of ESG. The second part defines ESG by classifying it into three dimensions, each with its corresponding themes and key issues across different areas. Following that, the work examines what advantages ESG provides and what challenges it encounters. ESG provides advantages for company sustainability and risk management. However, the challenges that ESG encounters in practice, such as lack of unified standard, managing and promoting difficulties, and increases in short term costs, also suggest that ESG's future is not promising.

The following section focuses on a specific topic - AI - regarding the future of ESG. AI's unprecedented computational power and auto-learning abilities have indeed proven their positive promotion in the development of ESG. However, AI also creates new challenges for ESG, which include power consumption, inequality, low accountability, and lack of moral and ethical responsibility. As a standard that integrates environmental, social, and governance factors, ESG's importance and necessity are obviously evident under current social needs for sustainable development.

References

[1] Pollman, E. (2024). The making and meaning of ESG. Harv. Bus. L. Rev., 14, 403.
[2] Matos, P. (2020). ESG and responsible institutional investing around the world: A critical review.
[3] Henisz, W., Koller, T., & Nuttall, R. (2019). Five ways that ESG creates value. McKinsey Quarterly, 4, 1-12.
[4] Li, T. T., Wang, K., Sueyoshi, T., & Wang, D. D. (2021). ESG: Research progress and future prospects. Sustainability, 13(21), 11663.
[5] Rau, P. R., & Yu, T. (2024). A survey on ESG: investors, institutions and firms. China Finance Review International, 14(1), 3-33.
[6] Friede, G., Busch, T., & Bassen, A. (2015). ESG and financial performance: aggregated evidence from more than 2000 empirical studies. Journal of sustainable finance & investment, 5(4), 210-233.
[7] Burnaev, E., Mironov, E., Shpilman, A., Mironenko, M., & Katalevsky, D. (2023). Practical AI cases for solving ESG challenges. Sustainability, 15(17), 12731.
[8] Elhady, A. M., & Shohieb, S. (2025). AI-driven sustainable finance: computational tools, ESG metrics, and global implementation. Future Business Journal, 11(1), 209.