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IS SUSTAINABILITY BEING OVERRUN BY AI IN COMPANY BOARDROOMS?

Jakub Kubicki

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Supervised by
Renata Blanc Esteves Bento de Mello & Manuel Emílio de Almeida Castelo Branco

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Biographic note

Jakub Kubicki is a Business Management Master's student following the double degree programme between Warsaw School of Economics and University of Porto with a background in data analysis, strategic planning, and project management. He holds a Bachelor's degree in Quantitative Methods and Information Systems acquired at Warsaw School of Economics. Jakub has gained experience in strategic pricing practices, analysing market trends, developing business strategies, and implementing data-driven solutions to optimize organizational performance. He is skilled in using various analytical tools and methodologies to drive strategic decision-making and improve business outcomes. Jakub is passionate about leveraging technology and innovation to create sustainable business practices and enhance corporate governance. Jakub is also a volunteering in Polish Scouting Association (ZHP) since 2012, currently engaged in the Jamboree (World Scout Mondial) Planning Team, contributing to organisation of biggest educational event for young people from all around the world, that will take place in Gdańsk, Poland in 2027.

Abstract

Over the past decades, sustainability has reshaped business practices and reporting, driven by stakeholder expectations and regulatory pressures. More recently, another transformative force has entered the business landscape: artificial intelligence (AI), which is redefining strategic priorities and reshaping boardroom agendas. Against this backdrop, an important question emerges: to what extent might the growing focus on AI influence the disclosure and prioritization of sustainability? This dissertation examines whether the rise of AI is overshadowing sustainability in CEO communications and explores how board characteristics influence these disclosures. Using quantitative content analysis of CEO letters, annual reports, and sustainability reports from US S&P 500 companies, the study finds that while AI is increasingly prominent, sustainability remains a key focus, though tensions between the two themes are evident. Sector, political context, and firm size shape the balance between AI and sustainability discourse. The results indicate that companies are adapting their narratives rather than abandoning sustainability, highlighting the need to harmonize innovation and responsibility. Practical recommendations are offered for aligning AI adoption with sustainability goals, with implications for corporate strategy, stakeholder engagement, and policy development.

Keywords: Artificial Intelligence, Sustainability, Corporate Governance, CEO Narratives, Quantitative Approach, Content Analysis

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1. Introduction

The imperative of sustainability in corporate governance became increasingly prominent in the past two decades years, driven by mounting regulatory requirements, investor expectations, and stakeholder demands (Freeman, 1984; Clarkson et al., 2008; Lu et al., 2024). Companies are expected not only to deliver financial performance but also to address environmental, social, and governance (ESG) issues as part of their long-term strategy. Transparent sustainability disclosure is widely recognized as a means to enhance corporate reputation, accountability, and stakeholder trust (Brown et al., 2017; Hoover & Fafatas, 2018).

More recently, artificial intelligence (AI) has emerged as a transformative force in the corporate landscape, reshaping business models, operational processes, and strategic priorities (Bonsón et al., 2023; Famularo, 2023). The rapid adoption of AI technologies is reflected in the growing emphasis on AI initiatives within boardroom discussions and public communications. As AI becomes a symbol of innovation and competitiveness, firms increasingly highlight their AI capabilities to signal alignment with technological progress and investor expectations (Bonsón et al., 2021).

Given the limited space available in CEO communications, topics such as sustainability and AI may compete for prominence. Prior research suggests that the framing and frequency of these themes in CEO letters can signal shifting corporate priorities and influence stakeholder perceptions (Patelli & Pedrini, 2014; Shin & You, 2017). This competition for attention raises important questions about the evolving dynamics of corporate disclosure: Is the growing focus on AI overshadowing sustainability initiatives in CEO communications? How do companies balance these competing imperatives in their strategic narratives?

CEO annual letters serve as vital channels for communicating organizational priorities to stakeholders. Their content provides unique insight into boardroom focus and the potential trade-offs between competing themes (Patelli & Pedrini, 2014). By analysing the language and emphasis within these communications, researchers can assess how firms navigate the intersection of innovation and responsibility.

This dissertation investigates whether the increasing prominence of AI is overshadowing sustainability initiatives in corporate disclosure, as reflected in the evolving narratives of CEOs. Specifically, it examines the frequency and framing of AI and sustainability discourse in CEO letters from S&P 500 companies between 2021 and 2024. The study also explores whether certain board characteristics influence the balance between AI and sustainability disclosure.

To address these questions, a quantitative content analysis is employed, utilizing dictionary-based text mining and regression modelling to systematically analyse CEO communications. The methodology is grounded in established practices in computational social science and corporate disclosure research (Bonsón et al., 2023; Lu et al., 2024). CEO letters are extracted from annual reports and proxy statements and analysed for thematic patterns and trends. Firm-level characteristics, including industry sector, political context, and organizational size, are incorporated to provide contextual insights.

The motivation for this study is multifaceted. First, there exists a gap in the literature regarding the intersection of sustainability and AI in corporate disclosures; current research often treats these domains separately, lacking comprehensive studies on their integration and potential conflicts (Lu et al., 2024; Bonsón et al., 2021). Second, the rapid integration of AI into business processes may have resulted in a shift in corporate priorities, with companies increasingly focusing on AI to enhance productivity and profitability, potentially at the expense of sustainability. Understanding how to balance AI and sustainability is crucial for companies seeking to maintain their competitive edge while fulfilling their corporate social responsibilities.

In developing this analysis, in the second chapter, the dissertation first situates the research question within the broader context of sustainability and AI in corporate governance, drawing upon a comprehensive review of the relevant literature. The theoretical frameworks and hypotheses that underpin the empirical investigation are then articulated in chapter three, followed by a detailed account of the methodological approach adopted for data collection and analysis in chapter four. Chapter five presents the findings and its interpretation in light of the theoretical perspectives, culminating in a discussion of their implications for corporate

strategy and stakeholder engagement in chapter six. Chapter 6 concludes the dissertation, offering recommendations for future research and practice.

Through this integrated approach, the study aspires to contribute novel insights into the evolving dynamics of executive communication at the intersection of sustainability and technological innovation.

2. Literature Review

Sustainability disclosure (corporate reporting on environmental, social, and governance performance) has become an essential part of corporate communication and governance, spurred by growing regulatory requirements and stakeholder demands (Christensen et al., 2021). Recent studies show that by 2021, over 86% of S&P 500 firms issued ESG reports, often guided by voluntary standards like Sustainability Accounting Standards Board (SASB), which improved the materiality and relevance of disclosures (Rouen et al., 2022). At the same time, AI disclosure (reporting on the use and governance of Artificial Intelligence in companies) is an emerging practice with no mandatory standards yet in place (Bonsón et al., 2021). Early studies show that while some firms mention AI projects in reports, such disclosures are inconsistent and often lack discussion of risks or ethics (Bonsón et al., 2021; Seele & Schultz, 2022). The question arises whether the rise of AI in corporate agendas is displacing the focus on sustainability in boardrooms, or if the two can be synergistically integrated in disclosure. Recent commentary has even introduced the term "machinewashing" – an analogy to greenwashing – to describe companies overstating or misrepresenting the ethical quality of their AI initiatives (Seele & Schultz, 2022).

This chapter reviews the academic literature on four related areas: (1) Sustainability disclosure in companies, (2) AI disclosure in companies, (3) Political Ideology and Executive Influence, and (4) the intersection of sustainability and AI in corporate disclosure which is the basis for identifying the literature gap and synthetise the research questions. The focus is on recent publications (post-2020) to capture the latest developments, though foundational studies are included where they remain influential. Both empirical research (e.g., statistical analyses of disclosure practices) and theoretical frameworks (conceptual models and definitions) are discussed.

2.1. Sustainability Disclosure and Corporate Efforts

Sustainability disclosure refers to the communication of a company's environmental, social, and governance (ESG) policies, risks, and performance. Over the past two decades, sustainability reporting has moved from a niche activity to a mainstream corporate practice (KPMG, 2020, as cited in Christensen et al., 2021). This sub-chapter reviews the

literature on how companies disclose their sustainability efforts, the frameworks they use, and the challenges they face in achieving transparency and accountability.

2.1.1 Frameworks and Standards for Sustainability Disclosure

Sustainability disclosure has become a critical aspect of corporate governance, driven by increasing regulatory requirements, investor expectations, and stakeholder demands (Christensen et al., 2021). Over the past two decades, multiple frameworks and standards have emerged to guide companies in reporting their environmental, social, and governance (ESG) information. The Global Reporting Initiative (GRI) is one of the earliest and most widely adopted frameworks, providing comprehensive guidelines and standardized metrics for sustainability reporting (Christensen et al., 2021, p. 1199). Many global companies use GRI Standards to structure their sustainability reports, covering areas like greenhouse gas emissions, energy use, labour practices, and community impacts.

Another influential standard-setter is the Sustainability Accounting Standards Board (SASB), which issues industry-specific disclosure standards focused on financially material ESG topics (Christensen et al., 2021). SASB's guidance helps firms identify which sustainability issues are most relevant to their particular industry (e.g., water usage for manufacturing vs. data security for tech firms) and report metrics accordingly. In recent years, there has also been a push towards integrated reporting, where companies combine financial and sustainability information into one report. The International Integrated Reporting Council (IIRC) framework encourages firms to explain how ESG performance is connected to financial performance and value creation over time (Bonsón et al., 2021). On the regulatory front, governments have started to mandate sustainability disclosure. The European Union's Non-Financial Reporting Directive (NFRD) (2014) requires large companies to include ESG information in their annual reports, introducing the concept of double materiality (firms must report not only how sustainability issues affect the business, but also how the business affects society and the environment). This will soon be strengthened by the EU's Corporate Sustainability Reporting Directive (CSRD), which from 2024 onward will enforce more detailed ESG disclosure standards and external assurance of sustainability data.

In the United States, while comprehensive sustainability reporting is still largely voluntary, the Securities and Exchange Commission (SEC) has proposed rules (in 2022) to require

climate-related disclosures, including greenhouse gas emissions and climate risk assessments, in companies' filings. Additionally, stock exchanges in many countries (e.g., London, Hong Kong) have listing requirements or guidelines for ESG reporting. In summary, a robust architecture of frameworks (GRI, SASB, IIRC) and emerging regulations (EU directives, SEC proposals) now underpins sustainability disclosure, pushing companies toward greater standardization and rigor in what they report (Christensen et al., 2021).

2.1.2 Corporate Disclosure Practices for Sustainability

In practice, most large companies today disclose sustainability information regularly, though the formats and depth of disclosure vary. A common practice is publishing an annual sustainability report (often also called a CSR or ESG report) alongside the financial annual report (Christensen et al., 2021, p. 1199). These reports typically align with the frameworks mentioned above: for example, a firm might structure its report according to GRI Standards, providing data on each material ESG topic, and also map its disclosures to SASB metrics to meet investor expectations. Many companies include a materiality assessment, identifying which sustainability issues are most significant to their business and stakeholders, and then focus the report on those issues (Famularo, 2023). Companies with advanced practices often integrate sustainability into their main annual report, an approach known as integrated reporting, to demonstrate how ESG considerations are embedded in their strategy (Bonsón et al., 2021). For instance, Unilever and Danone are known for integrated reports that connect their financial results with sustainability achievements and goals.

Firms also increasingly use digital platforms (corporate websites, interactive dashboards) to disclose real-time or more granular ESG data (though the annual report remains the primary formal channel). According to a KPMG global survey, by 2020 over 80% of N100 companies worldwide were reporting on sustainability in some form (Christensen et al., 2021), indicating that sustainability disclosure has become a mainstream corporate practice. However, the extent and quality of information can differ. Some companies provide detailed quantitative metrics (e.g., emissions in tons CO_2, employee turnover rates) and discuss performance against targets, while others remain fairly qualitative. Research shows that firms in industries with high environmental impact (like energy, mining) tend to disclose more environmental data to address stakeholder scrutiny, whereas firms in less tangible industries may emphasize social or governance aspects (Christensen et al., 2021). One observed trend is a move toward

external assurance of sustainability reports: roughly half of large-company sustainability reports globally are now audited or verified by independent parties to enhance credibility (Christensen et al., 2021, p. 1206). Regionally, European companies generally provide more comprehensive ESG disclosures, spurred by regulatory pressure (NFRD) and cultural expectations, whereas U.S. companies historically provided sparser ESG info in SEC filings, though many publish separate sustainability reports to satisfy investors (Hoover & Fafatas, 2018). Notably, stakeholder and investor pressures strongly influence disclosure practices. When investors explicitly call for certain data (e.g., carbon emissions or board diversity statistics), companies often respond by adding those to their reports. As evidence, Reid and Toffel (2009) found that companies targeted by shareholder proposals on climate change substantially increased their voluntary climate disclosures and even their industry peers followed suit. In short, companies disclose sustainability information through a variety of channels (stand-alone reports, integrated reports, websites), using recognized standards to shape the content. The practice is now widespread, but the level of detail and candour can vary widely, with leading firms providing richly documented accounts of their ESG performance and laggards offering more superficial statements (Cho & Patten, 2007; Famularo, 2023).

2.1.3 Quality, Credibility, and Impact of Sustainability Disclosures

The quality and credibility of sustainability disclosures have been a key concern in the literature. Early on, critics worried that ESG reports might be largely public relations exercises – mere "greenwashing" – rather than honest accounts of performance. Empirical studies, however, provide a nuanced view. Clarkson et al. (2008) conducted a rigorous analysis of U.S. companies in polluting industries and found a positive relationship between environmental performance and the extent of voluntary environmental disclosure. In their sample, firms with better environmental records (e.g., lower emissions, effective pollution controls) tended to have more extensive environmental disclosures, while poor performers disclosed less. This suggests that many firms use disclosure to inform – i.e., companies with nothing to hide are more transparent – consistent with voluntary disclosure theory. Clarkson et al. (2008)'s findings counter the notion that sustainability disclosure is purely cosmetic; instead, on average, transparency and actual performance often go hand in hand. That said, cases of strategic disclosure (or greenwashing) do exist. Cho and Patten (2007) found evidence that some companies with inferior environmental performance issued relatively

extensive environmental reports, likely aiming to manage public perception and legitimacy. Such firms might emphasize minor positive initiatives or use vague language to obscure poor results, aligning with legitimacy theory (which posits that firms disclose information to align with societal expectations and secure ongoing acceptance). Indeed, sustainability reports often mix substantive data with optimistic narrative, which can make it hard to discern the true performance. Over time, mechanisms have evolved to improve credibility. One is standardization: when firms all report using GRI or SASB metrics, stakeholders can compare them more easily and spot anomalies, discouraging egregious greenwashing. Another is third-party assurance: as noted, many firms now have auditors verify their ESG metrics (e.g., checking that emissions data or injury rates are reported accurately) (Christensen et al., 2021, p. 1206). Assurance adds cost but greatly increases user confidence in the data (Simnett et al., 2009). Furthermore, mandatory disclosure regimes with legal liability for misstatements (like the forthcoming EU CSRD) are expected to weed out unfounded claims and force companies to back their statements with evidence (Christensen et al., 2021). The economic and stakeholder impacts of sustainability disclosure are significant. Quality ESG disclosure has been linked with positive outcomes such as lower cost of capital and higher firm valuation. For example, Dhaliwal et al. (2011) found that companies initiating voluntary CSR disclosure experienced a decrease in cost of equity, as investors likely view greater transparency as reducing information risk. High disclosure transparency can also attract long-term institutional investors and improve a firm's stock liquidity (Amel-Zadeh & Serafeim, 2018). Additionally, firms with robust ESG reporting practices often enjoy better reputation and trust among stakeholders – which can translate into customer loyalty, employer attractiveness, and easier access to resources (Ioannou & Serafeim, 2017). On the flip side, if a company is caught exaggerating its sustainability achievements, the reputational damage can be severe and enduring. A notable example was the Volkswagen "Dieselgate" scandal: VW's sustainability reports claimed compliance and efficiency, but revelations of emissions cheating destroyed stakeholder trust and underscored that disclosure is only as good as the truth behind it.

Overall, the literature suggests that while not perfect, sustainability disclosures have become more credible and decision-useful over time. Many companies' reports genuinely reflect their ESG performance (Clarkson et al., 2008), and stakeholders increasingly rely on them – leading to tangible financial benefits for transparent firms (Dhaliwal et al., 2011). At the same

time, continuous improvement in standards, regulatory oversight, and assurance is important to maintain and enhance this credibility. The lessons learned in establishing reliable ESG reporting provide a useful point of reference for the newer challenge of AI disclosure, where similar issues of transparency and credibility are now arising.

2.2. AI Disclosure and Corporate Efforts

The disclosure of artificial intelligence (AI) activities in corporate communication has emerged as a distinct and increasingly relevant area of voluntary reporting, reflecting the growing strategic importance of AI in corporate governance and stakeholder engagement (Bonsón, Lavorato, Lamboglia, & Mancini, 2021; Famularo, 2023). As AI technologies become embedded in decision-making and operational processes, companies are increasingly expected to communicate how these systems are deployed, governed, and aligned with ethical standards (Seele & Schultz, 2022; Fioravante, 2024).

Unlike sustainability disclosure, which is guided by established frameworks such as the Global Reporting Initiative (GRI) and the Sustainability Accounting Standards Board (SASB), AI disclosure remains largely unregulated and fragmented. Firms exercise significant discretion over what to disclose, how much detail to provide, and which audiences to target, resulting in considerable variation across sectors and geographies (Bonsón et al., 2021; Bonsón, Bednárová, & Perea, 2023).

AI-related disclosures typically encompass information about projects, systems in use, algorithms deployed, and the integration of automated decision-making (ADM) into business processes. These disclosures serve multiple purposes: they reduce information asymmetry, signal technological competence, and help companies gain legitimacy in the eyes of stakeholders (Bonsón et al., 2023; Zhang, Zheng, & Meng, 2024). Firms may also disclose AI activities to attract investors, demonstrate innovation leadership, or align with emerging societal expectations around digital ethics and transparency (Famularo, 2023; Fioravante, 2024).

The structure and content of AI disclosures are still evolving. Bonsón et al. (2023) propose a taxonomy of disclosure elements grouped into three categories: governance and system

control, ethics and integrity, and strategic alignment. These include details such as oversight structures, stakeholder consultations, ethical guidelines, risk management strategies, and training initiatives related to responsible AI use.

Sectoral dynamics further influence disclosure practices. Companies in the technology and telecommunications sectors are more likely to report on AI activities due to higher stakeholder sensitivity and greater reliance on digital technologies (Bonsón et al., 2021). In the ICT sector specifically, AI disclosure is often embedded within broader digital transparency efforts. Famularo (2023) highlights how companies use both intentional and unintentional signalling to communicate the materiality of digital issues, including AI. These signals whether showcasing innovation or revealing inconsistencies play a critical role in shaping stakeholder perceptions.

2.2.1 Frameworks and Standards for AI Disclosure

The absence of universally accepted standards for AI disclosure has led to a fragmented landscape where companies adopt diverse approaches based on sectoral norms, stakeholder expectations, and internal governance priorities (Papyshev & Chan, 2024). Unlike sustainability reporting, which benefits from frameworks such as GRI and SASB, AI disclosure lacks a formalized structure, resulting in inconsistent and often superficial reporting practices.

Bonsón et al. (2023) propose a classification of AI disclosure elements into three core categories: governance and system control, ethics and integrity, and strategic alignment. These categories encompass disclosures on AI governance structures, stakeholder consultations, ethical oversight mechanisms, risk management strategies, and training initiatives related to responsible AI use. This taxonomy provides a conceptual foundation for standardizing AI reporting across industries and jurisdictions, particularly in annual and sustainability reports.

In parallel, Bonsón et al. (2021) highlight the role of voluntary disclosure, signalling theory, and legitimacy theory in shaping corporate AI communication. Their integrated framework explains how companies disclose AI information to reduce information asymmetry (voluntary disclosure theory), signal innovation and competence (signalling theory), and align

with societal expectations (legitimacy theory). This theoretical lens helps explain the variation in disclosure depth and tone across firms and sectors.

From a corporate digital responsibility (CDR) perspective, Famularo (2023) notes that emerging norms around digital issue disclosure are beginning to shape how companies report on AI. These frameworks emphasize transparency, stakeholder engagement, and ethical data use, and are increasingly being referenced in CSR and non-financial reporting contexts. Scholars such as Papyshev and Chan (2024) argue that integrating AI into ESG-like frameworks covering governance, strategy, risk management, and performance metrics could leverage investor pressure to counteract selective reporting of AI issues.

2.2.2 Corporate Practices in AI Disclosure

Corporate practices in AI disclosure remain highly heterogeneous, shaped by sectoral dynamics, geographic variation, and internal strategic priorities. While some companies have begun to systematically report on their AI initiatives, others remain cautious, offering only vague or symbolic references. This variation reflects the voluntary nature of AI disclosure in most jurisdictions and the absence of standardized reporting frameworks (Bonsón et al., 2023).

A comprehensive study by Bonsón et al. (2023) analysed 962 annual and sustainability reports from 337 Western European companies and found that AI disclosure particularly regarding ADM is still in its early stages. The financial sector leads in adoption, often disclosing ADM use in credit risk assessment and customer profiling. However, according to those authors most disclosures are general in nature, lacking technical detail or ethical context. Additionally, companies tend to emphasize favourable aspects of AI use, consistent with signalling theory, while avoiding deeper transparency about algorithmic operations or governance structures.

In a complementary study, Bonsón et al. (2021) examined AI-related disclosures across 200 listed companies in Germany, Sweden, Finland, France, Spain, and Italy. They found that only 58.5% of companies reported any AI activity, and fewer than 5% addressed ethical considerations. Larger firms and those in the technology and telecommunications sectors were more likely to disclose AI-related information, often as part of broader digital transformation narratives. The study also introduced a taxonomy of AI disclosure types

ranging from project-level reporting to ethical guidelines which can serve as a foundation for future benchmarking.

Famularo (2023) conducted a qualitative discourse analysis of 40 ICT firms from the Fortune Global 500, including companies from the U.S., China, and Latin America. The study found that leading firms such as Apple, Amazon, Alibaba, and Cisco embed AI disclosures within broader digital responsibility narratives. These disclosures often serve as signalling mechanisms, with both positive and negative signals shaping stakeholder perceptions. Notably, the study emphasized the importance of "silences" in disclosure what companies omit can be as revealing as what they include.

Best practices identified across these studies include the inclusion of dedicated AI sections in annual or sustainability reports (e.g., Cisco's ESG Hub), disclosure of AI governance structures such as ethics boards or oversight committees, descriptions of AI use cases in high-risk or customer-facing domains, reference to ethical principles including fairness, transparency, and accountability, and stakeholder engagement mechanisms such as consultations or feedback loops (Famularo, 2023; Bonsón et al., 2023).

2.2.3 Quality, Credibility, and Impact of AI Disclosures

Despite growing interest in AI transparency, companies face significant challenges in disclosing their AI-related activities. These challenges stem from internal organizational constraints and broader systemic issues, including technological complexity, reputational risk, and the lack of standardized frameworks (Bonsón et al., 2023; Seele & Schultz, 2022).

One of the most persistent barriers is the selective nature of disclosure. Firms tend to highlight the benefits of AI such as efficiency gains and innovation while omitting or downplaying potential risks, including algorithmic bias, privacy violations, and job displacement. Bonsón et al. (2021) found that companies rarely disclose negative information, instead using AI reporting as a signalling mechanism to influence investor perceptions and reduce information asymmetry. This practice aligns with the concept of "camouflage signals," where disclosures are crafted to appear transparent while concealing critical details (Zhang et al., 2024).

The epistemic ambiguity of AI systems further complicates disclosure. Famularo (2023) notes that ICT firms often struggle to communicate the materiality of digital issues, including AI, due to the abstract and technical nature of the subject. This leads to vague or symbolic disclosures that lack methodological rigor or verifiable data. In some cases, companies hyperlink to external sources or transparency hubs rather than providing direct answers to disclosure prompts, undermining the clarity and accountability of their reports.

Ethical concerns also play a role. The rapid deployment of AI in sensitive domains such as finance, healthcare, and employment raises questions about fairness, accountability, and human oversight. Yet, as Bonsón et al. (2023) argue, many companies are ill-equipped to address these issues in their disclosures, either due to a lack of internal expertise or fear of reputational damage.

The credibility of AI disclosures is further undermined by the absence of third-party assurance mechanisms. Unlike sustainability reports, which are increasingly subject to external verification, AI disclosures are rarely audited or independently reviewed. This lack of assurance limits their reliability and reduces stakeholder trust (Seele & Schultz, 2022).

Nonetheless, emerging research suggests that firms adopting transparent and ethically grounded AI disclosure practices may benefit from enhanced stakeholder trust and improved financial performance. Naveed, Shaukat, and Rapti (2025) found that companies integrating AI initiatives with strong governance and sustainability frameworks experienced positive effects on firm value, suggesting that responsible AI disclosure can serve as a strategic asset.

2.2.4 Challenges in AI Disclosure

While the strategic relevance of artificial intelligence (AI) in corporate governance continues to grow, companies face persistent and multifaceted challenges in disclosing AI-related activities. These challenges are not merely technical or operational they are deeply rooted in the structural absence of standardized reporting mechanisms, the epistemic complexity of AI systems, and the ethical ambiguity surrounding their deployment (Minkkinen, Heikkilä, & Pihlajarinne, 2022; Papyshev & Chan, 2024).

One of the most fundamental obstacles is the lack of a universally accepted framework for AI disclosure. Unlike sustainability reporting, which benefits from mature standards such as GRI and SASB, AI disclosure remains largely voluntary and unstructured. This absence of harmonized guidelines leads to fragmented reporting practices, where firms self-select what to disclose based on internal priorities and external pressures (Bonsón, Bednárová, & Perea, 2023). As a result, disclosures vary widely in scope, depth, and credibility, making it difficult for stakeholders to assess AI maturity or compare governance practices across firms (Papyshev & Chan, 2024). The lack of sector-specific benchmarks further exacerbates this issue, particularly in industries where AI is rapidly evolving but regulatory oversight remains minimal.

Another critical challenge lies in the epistemic opacity of AI systems. Many AI models, especially those based on deep learning, operate as "black boxes," making it difficult for even their developers to fully understand or explain how decisions are made (Minkkinen et al., 2022). This technical complexity poses a significant barrier to meaningful disclosure. Firms may struggle to articulate the logic, limitations, or risks of their AI systems in a way that is both accurate and accessible to non-technical stakeholders. Consequently, disclosures often rely on vague or symbolic language, which undermines their transparency and accountability (Famularo, 2023). In some cases, companies resort to hyperlinking external resources or publishing standalone AI ethics statements that are disconnected from their core financial or governance reports, further diluting the coherence of their communication (Fioravante, 2024).

Ethical ambiguity also complicates disclosure efforts. The deployment of AI in sensitive domains-such as hiring, lending, and healthcare raises profound questions about fairness, accountability, and human oversight. Yet many firms lack the internal expertise or governance structures to address these concerns systematically (Bonsón et al., 2023). As a result, ethical risks are often underreported or omitted entirely from corporate disclosures. Seele and Schultz (2022) warn that this selective reporting can lead to "machinewashing," where companies present an illusion of ethical AI governance without substantive evidence. Zhang, Zheng, and Meng (2024) further demonstrate that firms engaging in digital ethics signalling are less likely to subject their disclosures to external audit, suggesting a strategic avoidance of scrutiny.

The reputational risks associated with AI disclosure also contribute to corporate reticence. Firms may fear that revealing too much about their AI systems especially potential flaws or ethical dilemmas could invite public criticism, regulatory intervention, or legal liability. This concern is particularly acute in industries where AI failures have already led to high-profile controversies, such as algorithmic bias in recruitment or misinformation amplification in social media platforms (Minkkinen et al., 2022). In such contexts, companies may choose to disclose only sanitized narratives that emphasize innovation and efficiency, while avoiding discussions of risk or governance.

Finally, the regulatory landscape remains underdeveloped and uneven across jurisdictions. While some countries have issued AI ethics guidelines, these are typically non-binding and lack enforceable disclosure requirements. Papyshev and Chan (2024) argue that this regulatory vacuum allows firms to self-define the scope and depth of their AI disclosures, which can lead to strategically curated narratives that prioritize reputational management over transparency. Without legal mandates or standardized metrics, firms face little consequence for underreporting or misrepresenting their AI activities, further weakening the integrity of corporate communication.

2.3. Political Ideology and Governance Characteristics impact on ESG and AI Disclosure

2.3.1 Political Ideology and Corporate Social Responsibility

The political ideology of corporate executives has emerged as a significant determinant of corporate social responsibility (CSR) engagement. Chin, Hambrick, and Treviño (2013) provided foundational evidence that liberal CEOs are more likely to prioritize CSR initiatives than their conservative counterparts, particularly when they hold substantial power within the organization. Their study, based on a sample of S&P 500 firms, demonstrated that CEO ideology influences not only the volume but also the strategic integration of CSR activities (Chin et al., 2013).

Building on this, Gupta, Briscoe, and Hambrick (2017) introduced the concept of organizational political ideology, showing that firms led by liberal executives engage more actively in CSR, especially in industries where such practices are not yet institutionalized. Their findings suggest that political ideology shapes not only individual behaviour but also organizational norms and strategic direction.

More recently, Coelho (2024) examined the interplay between CEO political orientation and corporate political activity, finding that liberal CEOs tend to align ESG performance with broader societal goals, while conservative CEOs are more likely to pursue ESG selectively, often in response to regulatory or reputational pressures. This conditional influence underscores the complexity of ideological effects, suggesting that political orientation interacts with contextual factors such as industry norms, stakeholder expectations, and governance structures.

Together, these studies highlight that political ideology is not a peripheral characteristic but a central driver of how executives interpret and act upon CSR imperatives. Liberal-leaning CEOs are generally more proactive and expansive in their CSR commitments, while conservative CEOs may adopt a more cautious or instrumental approach.

2.3.2 CEO Characteristics and Corporate Sustainability

Beyond political ideology, research has shown that demographic and experiential characteristics of CEOs also play a critical role in shaping corporate sustainability strategies. Huang (2013) found that CEO educational background, tenure, and gender significantly influence the consistency and depth of CSR performance. Specifically, CEOs with advanced degrees in social sciences or humanities, longer tenures, and female gender were associated with more stable and comprehensive CSR engagement.

Kim (2024) extended this line of inquiry by examining the interaction between CEO and board political ideology. The study found that liberal CEOs positively influence environmental performance, but this effect is moderated by the conservatism of the board. In firms with conservative boards, liberal CEOs may face resistance or constraints that limit their ability to implement progressive sustainability initiatives.

These findings suggest that CEO characteristics both ideological and demographic interact with organizational structures to shape sustainability outcomes. The presence of supportive governance mechanisms, such as aligned boards or stakeholder engagement processes, can amplify the positive effects of progressive leadership, while misalignment may dampen or distort executive influence.

2.3.3 Political Ideologies and AI Disclosure

The influence of executive political ideology extends beyond CSR and sustainability into emerging domains such as AI disclosure. While empirical research on this specific intersection is still developing, theoretical extrapolation from CSR literature provides valuable insights.

Chin et al. (2013) and Gupta et al. (2017) suggest that liberal CEOs, who are generally more attuned to stakeholder concerns and ethical imperatives, may be more inclined to disclose information about AI governance, risks, and ethical safeguards. This aligns with the broader tendency of liberal executives to embrace transparency and social accountability.

Coelho (2024) adds nuance by showing that political orientation interacts with corporate political activity, implying that liberal CEOs may be more responsive to public discourse on AI ethics, while conservative CEOs might prioritize strategic or reputational considerations. In the context of AI, this could mean that liberal-led firms are more likely to disclose algorithmic bias audits, data governance policies, or stakeholder consultation processes, whereas conservative-led firms may focus on performance metrics or innovation narratives. Although direct empirical studies on political ideology and AI disclosure are limited, the conceptual parallels with CSR suggest that executive ideology is likely to shape not only the content but also the tone and intent of AI-related communication. Liberal CEOs may frame AI disclosure as part of a broader ethical commitment, while conservative CEOs may approach it as a risk management or compliance issue.

2.3.4 CEO Characteristics and AI Disclosure

CEO demographic characteristics also appear to influence AI disclosure practices, though this area remains underexplored. Drawing from CSR literature, Huang (2013) found that CEOs with longer tenure and advanced education are more consistent in their sustainability reporting, a pattern that may extend to AI governance disclosures. Experienced CEOs may

be better equipped to understand the strategic and ethical implications of AI, leading to more thoughtful and comprehensive reporting.

Zalata et al. (2019) suggest that female CEOs are more risk-averse, which could result in more cautious and transparent AI disclosures, particularly in high-stakes domains such as automated decision-making or data privacy. However, as with CSR, risk aversion does not necessarily equate to ethical leadership, and further research is needed to unpack the nuances of gendered disclosure behaviour.

Kim (2024) highlights the moderating role of board ideology, showing that even progressive CEOs may be constrained by conservative boards. In the context of AI, this could mean that efforts to disclose ethical risks or governance structures may be diluted or reframed to align with board preferences. These dynamic underscores the importance of organizational alignment in shaping disclosure practices.

Overall, the literature suggests that CEO characteristics both ideological and demographic play a significant role in shaping AI disclosure, though empirical validation remains limited. Future research should explore how these traits interact with organizational culture, stakeholder pressure, and regulatory environments to influence the transparency and accountability of AI governance.

2.4. Intersection of AI and Sustainability: Literature Gap and Research Questions

2.4.1 Theoretical Background and Emerging Intersection

The intersection of artificial intelligence (AI) and sustainability in corporate strategy and disclosure is an emerging area of inquiry that remains underdeveloped in academic literature. While both domains have received substantial attention independently, their convergence particularly in the context of executive communication and strategic framing has only recently begun to attract scholarly interest (Fioravante, 2024; Famularo, 2023).

Several conceptual frameworks suggest that AI and sustainability are not inherently antagonistic but can be mutually reinforcing. For instance, Truby (2020) argues that AI, when governed responsibly, can serve as a catalyst for achieving the United Nations Sustainable Development Goals (SDGs), particularly in areas such as climate modelling, resource optimization, and social inclusion. Similarly, Di Vaio et al. (2020) highlight the role of digital innovation, including AI, in enabling sustainable business models through enhanced efficiency and data-driven decision-making.

Despite these theoretical propositions, empirical evidence on how companies integrate AI and sustainability in their strategic narratives remains limited. Bonsón et al. (2021) and Bonsón et al. (2023) found that while many firms mention AI in their reports, few explicitly link it to sustainability goals or ethical governance structures. Famularo (2023) further notes that ICT firms often embed AI within broader digital responsibility narratives, but these disclosures are typically vague and lack substantive detail.

The literature also points to potential tensions between AI and sustainability. Hilson (2024) observes that in certain political and regulatory contexts, companies may prioritize AI-driven innovation over sustainability commitments, especially when ESG initiatives are politicized or perceived as costly. Seele and Schultz (2022) warn of "machinewashing," a phenomenon where firms use AI ethics rhetoric to distract from or compensate for weak sustainability performance.

These findings suggest that the relationship between AI and sustainability is complex and contingent on multiple factors, including industry norms, stakeholder expectations, and executive ideology. However, the lack of integrated frameworks and comparative studies leaves a significant gap in understanding how firms navigate this intersection in practice.

2.4.2 Literature Gap

Despite the growing body of research on CEO ideology, AI, and sustainability, several gaps remain:

I. Most studies treat AI and sustainability as separate domains, with limited exploration of their intersection in corporate narratives and strategic communication (Bonsón et al., 2021; Famularo, 2023).

II. The influence of CEO political ideology on the balance between AI and sustainability in executive messaging is underexplored. While Chin et al. (2013) and Gupta et al. (2017) have examined ideological effects on CSR, their frameworks have not been extended to AI governance or disclosure.

III. There is a lack of empirical research on how firms navigate the tension between AI-driven innovation and sustainability commitments in the face of political and stakeholder pressures. Existing studies tend to focus on either technological adoption or ESG performance, without examining how these priorities are reconciled or contested in executive narratives (Hilson, 2024; Fioravante, 2024).

IV. Industry-specific dynamics in AI and sustainability framing remain poorly understood. While some sectoral analyses exist (e.g., Bonsón et al., 2023), they do not systematically compare how different industries prioritize these themes.

V. The role of organizational scale, particularly differences between large corporations and small-to-medium enterprises (SMEs)in shaping AI and sustainability discourse has received minimal attention. This is a critical oversight given the resource and governance disparities between firms of different sizes.

2.4.3 Research Questions

To address these gaps, this dissertation examines how CEOs frame AI and sustainability in their communications, with a focus on ideological influences, industry context, and organizational scale. The analysis centres on CEO letters published between 2021 and 2024, offering a longitudinal and comparative perspective on executive narratives.

Based on the literature review, the following research questions are proposed:

RQ 1. How has the frequency of AI-related topics in CEOs' communications changed between 2021 and 2024?

RQ 2. How do CEOs frame and prioritize AI and sustainability themes in their stakeholder-directed communications, particularly within CEO letters?

RQ 3. Are there industry-specific patterns in how AI and sustainability are framed?

RQ 4. How does the state of origin and it's political leaning affect the prominence of AI versus sustainability?

RQ 5. What are the differences in CEOs' narratives about AI and sustainability between large corporations and small-to-medium enterprises?

These questions aim to uncover the evolving dynamics of corporate narratives and contribute to a more nuanced understanding of strategic communication in the age of AI and ESG. By integrating ideological, sectoral, and organizational dimensions, the study seeks to advance theoretical and empirical knowledge on how firms reconcile innovation and responsibility in their public discourse.

3. Theoretical Framework and hypothesis

This chapter develops a set of testable hypotheses grounded in two core theoretical perspectives: Stakeholder Theory and Legitimacy Theory. These frameworks are particularly suited to examining how firms balance AI and sustainability in their strategic communication, and how CEO ideology and industry context shape these narratives. The hypotheses are designed to fill the literature gaps identified in Section 2.4 and provide a conceptual foundation for the empirical analysis.

3.1.1 Theoretical Framework Stakeholder Theory

Stakeholder Theory posits that firms must address the expectations of a broad range of stakeholders including investors, regulators, customers, employees, and civil society to maintain legitimacy and long-term success (Freeman, 1984). In the context of AI and sustainability, this theory suggests that firms must communicate how their technological innovations align with broader societal goals and ethical standards. Research by Smith, Jones, and Brown (2019) supports the notion that addressing stakeholder concerns can enhance corporate reputation, stakeholder trust, and long-term performance. Moreover, larger firms with more diverse stakeholder groups are likely to face greater pressure to disclose both AI and sustainability initiatives (Huang, 2013; Famularo, 2023).

3.1.2 Legitimacy Theory

Legitimacy Theory complements this view by emphasizing that firms seek to align their actions and disclosures with prevailing social norms and values to secure legitimacy (Suchman, 1995). In this framework, corporate communication particularly public-facing narratives such as CEO letters serves as a tool for managing legitimacy. Disclosures about AI and sustainability can thus be interpreted as strategic responses to stakeholder expectations, regulatory scrutiny, and reputational risk. Bonsón, Bednárová, and Perea (2023) highlight the importance of transparency and ethical considerations in gaining legitimacy for AI initiatives, especially in sectors where algorithmic decision-making affects public welfare. Similarly, Seele and Schultz (2022) warn that superficial or symbolic disclosures termed "machinewashing" may undermine legitimacy if not backed by substantive governance.

3.2. Hypotheses Development

3.2.1 RQ1: Increase in AI disclosure.

As AI becomes a symbol of innovation, efficiency, and competitive advantage, firms increasingly highlight AI initiatives in their strategic communication. This trend reflects both stakeholder expectations for technological leadership and legitimacy pressures to demonstrate alignment with digital transformation narratives (Bonsón et al., 2023; Famularo, 2023; Papyshev & Chan, 2024).

> H1: The frequency of AI-related discourse in CEO communications has increased between 2021 and 2024.

This hypothesis is grounded in Legitimacy Theory. As AI becomes a symbol of innovation and competitiveness, firms increasingly highlight AI initiatives to signal alignment with technological progress and investor expectations (Bonsón et al., 2023; Famularo, 2023).

3.2.2 RQ2: Decrease of Sustainability-related disclosure in favour of AI

As firms allocate limited communication space, there may be a trade-off between emphasizing AI and sustainability. While both topics are important, the rising prominence of AI may lead to a relative decline in sustainability-related discourse, particularly in industries where ESG is politicized or perceived as less strategically urgent (Hilson, 2024; Seele & Schultz, 2022).

> H2: Firms with higher AI-related discourse exhibit a relative decline in sustainability-related discourse over time.

Drawing on Stakeholder Theory, this hypothesis explores whether firms prioritize one stakeholder concern (technological innovation) over another (environmental responsibility), especially when communication space is limited. The hypothesis also reflects the literature gap on the potential trade-off between AI and sustainability in corporate narratives.

3.2.3 RQ3: Sector influence on Sustainability vs AI disclosure evolution

Industry context plays a critical role in shaping disclosure priorities. Firms in technology-intensive sectors (e.g., IT, finance) are more likely to emphasize AI due to its strategic relevance and stakeholder expectations for innovation. In contrast, firms in resource-intensive sectors (e.g., energy, materials) face stronger environmental scrutiny and are more likely to emphasize sustainability (Bonsón et al., 2021; Lu et al., 2024; Di Vaio et al., 2020).

H3: Firms in technology-intensive sectors (e.g., IT, finance) are more likely to emphasize AI over sustainability, while firms in resource-intensive sectors (e.g., materials, energy) are more likely to emphasize sustainability.

This hypothesis is informed by Legitimacy Theory, which suggests that firms tailor their disclosures to align with sector-specific stakeholder expectations and regulatory pressures (Bonsón et al., 2021; Lu et al., 2024).

3.2.4 RQ4: Political influence on Sustainability vs AI disclosure evolution

Political context influences corporate priorities and stakeholder expectations. Firms located in democratic or liberal-leaning states may face stronger pressure to engage with sustainability issues, while those in conservative states may prioritize efficiency and innovation, including AI adoption (Chin et al., 2013; Gupta et al., 2017; Kim, 2024).

H4a: Firms located in democratic states are more likely to emphasize sustainability in their communications.

H4b: Firms located in conservative states are more likely to emphasize AI in their communications.

These hypotheses are grounded in Stakeholder Theory and supported by prior research showing that democratic states tend to prioritize CSR and environmental issues (Chin et al., 2013; Gupta et al., 2017), while conservative leaning of the state is the environment where the focus is more on efficiency and innovation (Kim, 2024).

3.2.5 RQ5: Company Size Influence on Sustainability

Organizational scale affects disclosure capacity and stakeholder visibility. Large firms, with more resources and broader stakeholder engagement, are incentivized to address multiple concerns simultaneously. SMEs, facing resource constraints and narrower stakeholder scrutiny, may focus on a single strategic narrative (Huang, 2013; Famularo, 2023; Bonsón et al., 2021).

H5: Large firms are more likely to disclose both AI and sustainability initiatives, while SMEs are more likely to focus on one or the other.

This hypothesis is grounded in Stakeholder Theory and reflects the differential pressures faced by firms of varying sizes.

4. Methodology

4.1. Introduction

This study adopted a quantitative research design to examine whether sustainability is being overshadowed by artificial intelligence (AI) in corporate boardrooms, as reflected in CEO communications. The methodological approach is grounded in content analysis and statistical modelling, drawing on established practices in computational social science and corporate disclosure research (Bonsón et al., 2021; Famularo, 2023; Lu et al., 2024). The primary objective is to analyse the frequency and framing of AI and sustainability narratives in CEO letters from S&P 500 companies between 2021 and 2024.

The rationale for this approach is threefold. First, CEO letters are recognized as strategic communication tools that reflect organizational priorities and stakeholder engagement strategies (Patelli & Pedrini, 2014; Shin & You, 2017). Second, dictionary-based text mining enables the systematic identification of thematic patterns across a large corpus of documents, enhancing replicability and objectivity (Bonsón et al., 2023). Third, regression modelling allows for the exploration of relationships between discourse patterns and firm-level characteristics, such as industry sector, political context, and organizational size (Gupta et al., 2017; Kim, 2024). Additionally, the methodology uses log-transformed total assets to measure firm size, following best practices in disclosure research (Chin et al., 2013; Clarkson et al., 2008). This ensures a more robust control for organizational scale and performance in the analysis.

4.2. Data Gathering

The dataset consists of "CEO letters to stakeholders" extracted from annual reports and proxy statements of S&P 500 companies. These documents are retrieved manually from official corporate websites, SEC filings and investor relations portals. The inclusion criteria require that each firm has publicly available CEO communications for all four years (2021–2024) across the three document types to ensure longitudinal consistency.

A Python script automates the extraction of text from .txt, .docx, and .pdf files using the docx and PyMuPDF libraries. Each document is parsed to extract the total word count and

the frequency of AI- and sustainability-related keywords. The filenames follow a standardized format to facilitate automated parsing and metadata assignment.

This approach follows the precedent set by Hoover and Fafatas (2018), who emphasize the importance of consistent temporal coverage in voluntary disclosure studies. Metadata such as firm name, industry classification (based on GICS), state of headquarters, and firm size measured as the natural logarithm of total assets were also collected to support contextual analysis. The use of log-transformed total assets as a continuous measure of firm size is well-established in the literature, as it mitigates skewness in financial data and enhances the robustness of statistical modelling in disclosure research (Chin, Hambrick, & Treviño, 2013). This replaces the earlier categorical classification (Small, Mid, Large) and allows for more nuanced modelling.

4.3. Data Processing and Text Mining

After collection, the documents are processed using Python-based text mining techniques. The preprocessing pipeline includes format normalization, text extraction, lowercasing, punctuation removal, and whitespace normalization. Tokenization is performed using the Natural Language Toolkit (NLTK) and spaCy libraries to segment the text into sentences and words.

The core of the content analysis relies on two custom-built keyword dictionaries, one for AI and one for sustainability. These dictionaries were developed iteratively through a pre-reading phase and refined based on prior literature (Bonsón et al., 2021; Bonsón et al., 2023). Each dictionary includes unigrams and bigrams relevant to its domain (e.g., "machine learning," "carbon neutral"). The dictionaries are presented in Table 12 (appendix) and applied using regular expression matching to identify keyword occurrences.

The frequency of AI and sustainability mentions is calculated both in absolute terms and as a percentage of total word count. This normalization allows for standardized comparisons across firms and time periods, consistent with the methodology used by Famularo (2023) in analysing digital responsibility disclosures. Another script is used to identify and exclude documents with zero-word count, ensuring data quality.

The next step is to use scripting to pivot the dataset into a wide format, enabling year-over-year comparisons. The process also calculates the percentage change in AI and sustainability mentions between 2021 and 2024. Additional scripting further enhances the dataset by merging it with political and financial metadata, including state-level political leaning and firm size classification (ln of total assets), following the approach of Kim (2024) and Coelho (2024).

The dictionaries are validated against GRI and SASB standards (for sustainability) and the Bonsón et al. (2023) taxonomy (for AI), ensuring content validity. Lemmatization and stemming are applied to unify term variations (e.g., "sustainable" and "sustainability"), and context checks are performed to avoid false positives.

4.4. Data Analysis and Statistical Modelling

The analytical phase employed multiple regression models to test the study's hypotheses. The primary dependent variables were the percentage of sustainability mentions and the AI-to-sustainability ratio. Independent variables included:

- Percentage of AI mentions
- Year (2021–2024)
- Sector (GICS classification)
- Firm size (ln of total assets)
- Political leaning (Democratic = 0, Republican = 1)

Ordinary least squares (OLS) regression was used to assess temporal trends and substitution effects between AI and sustainability discourse.

The modelling strategy was informed by prior research on CEO ideology and corporate disclosure (Chin et al., 2013; Gupta et al., 2017; Kim, 2024).

Table 1 Variable Definitions and Analytical Roles

Variable Name	Type	Description (Measurement/Coding)	Role in the Analysis	Source and Justification
AI Mentions_2021 – AI Mentions_2024	Continuous	Annual count of AI-related terms in CEO communications (raw frequency per year).	Measures absolute AI discourse over time.	Derived from textual analysis of CEO letters; reflects topical emphasis.
Sustainability Mentions_2021 – Sustainability Mentions_2024	Continuous	Annual count of sustainability-related terms in CEO communications (raw frequency per year).	Measures absolute sustainability discourse over time.	Derived from textual analysis of CEO letters; reflects ESG-related emphasis.
Percentage of AI Mentions_2021 – Percentage of AI Mentions_2024	Continuous	Share of AI-related terms relative to total word count in CEO communications, expressed as a percentage.	Normalizes AI emphasis across firms of varying communication length.	Computed from full-text parsing; controls for verbosity bias.
Percentage of Sustainability Mentions_2021 – Percentage of Sustainability Mentions_2024	Continuous	Share of sustainability-related terms relative to total word count in CEO communications, expressed as a percentage.	Normalizes sustainability emphasis across firms.	Computed from full-text parsing; controls for verbosity bias.
Political Leaning	Binary (0/1)	Coded as 0 for Democrat-leaning states and 1 for Republican-leaning states, based on 2020 U.S. presidential election results.	Moderator variable for political context.	Assigned by firm headquarters location; justified by state-level electoral outcomes.

Variable Name	Type	Description (Measurement/Coding)	Role in the Analysis	Source and Justification
ln_total assets	Continuous	Natural logarithm of firm total assets (in USD), used to normalize firm size distribution.	Proxy for firm size in regression and stratified analysis.	Extracted from financial statements; log transformation reduces skew and improves comparability. (Chin et al., 2013; Clarkson et al., 2008)
Avg_AI_Mentions	Continuous	Mean of AI mentions across 2021–2024 for each firm.	Aggregated measure of AI discourse intensity.	Computed from annual values; used in firm-level comparisons.
Avg_Sus_Mentions	Continuous	Mean of sustainability mentions across 2021–2024 for each firm.	Aggregated measure of sustainability discourse intensity.	Computed from annual values; used in firm-level comparisons.
Avg_AI_Pct	Continuous	Mean percentage of AI mentions across 2021–2024 for each firm.	Aggregated normalized AI emphasis.	Controls for communication length; used in percentage-based analysis.
Avg_Sus_Pct	Continuous	Mean percentage of sustainability mentions across 2021–2024 for each firm.	Aggregated normalized sustainability emphasis.	Controls for communication length; used in percentage-based analysis.
Total_Word_Count	Continuous	Total number of words in each CEO letter	Normalization Base	Standard practice in text mining (Bonsón et al., 2021; Famularo, 2023)
Sector	Categorical	Industry classification based on GICS (e.g., IT, Materials, Finance, etc.)	Moderator / Control Variable	Gupta et al. (2017); Hoover & Fafatas (2018)

4.5. Descriptive Overview of the Dataset

This study draws upon a structured dataset comprising CEO communications from 414 publicly listed firms, primarily constituents of the S&P 500 index. The dataset spans a four-year period (2021–2024) and includes 12 variables capturing firm-level characteristics, political context, and thematic content related to artificial intelligence (AI) and sustainability discourse. The primary data sources include CEO letters, from annual reports and proxy statements, which were subjected to computational content analysis using a dictionary-based text mining approach.

4.5.1 Sectoral Composition

Firms were categorized according to the Global Industry Classification Standard (GICS), enabling sector-specific comparisons. As shown in Table 6.1, the largest representation came from the Industrials (n = 67), Financials (n = 66), and Health Care (n = 51) sectors. The Information Technology sector, which is of particular interest given its association with AI innovation, comprised 47 firms. Sectors with lower representation included Communication Services (n = 14) and Energy (n = 18), which nonetheless exhibited distinctive patterns in narrative emphasis.

Table 2 Sectoral Distribution of Firms in the Sample (N = 414)

GICS Sector	Frequency	Percentage (%)
Industrials	67	15.59%
Financials	66	15.36%
Health Care	51	11.88%
Information Technology	47	10.94%
Consumer Discretionary	45	10.47%
Consumer Staples	30	6.98%
Utilities	26	6.05%
Real Estate	25	5.82%
Materials	25	5.82%
Energy	18	4.19%
Communication Services	14	3.26%

This distribution reflects the diversity of the S&P 500 and allows for robust cross-sectoral analysis of narrative trends in CEO communications.

4.5.2 Firm Size and Political Context

Firm size was operationalized as the natural logarithm of total assets (ln[Total Assets]), a continuous measure widely used in corporate governance and disclosure research to account for scale effects and reduce skewness in financial data (Chin, Hambrick, & Treviño, 2013; Kim, 2024). This approach enhances comparability across firms and supports robust statistical inference.

Political leaning was coded as a binary variable based on the state in which each firm is headquartered. States were classified as Democrat-leaning or Republican-leaning according to the results of the U.S. presidential election (2020), following established practice in the literature (Kim, 2024; Chin et al., 2013). Firms headquartered in states that voted for the Democratic candidate were coded as Democrat-leaning (n = 274), while those in states that voted for the Republican candidate were coded as Republican-leaning (n = 140). This variable was included to test hypotheses regarding the influence of political context on corporate discourse, consistent with prior research on CEO ideology and ESG communication.

4.5.3 Key Variables and Measurement

The core variables of interest were the frequency of AI and sustainability mentions in CEO communications. These were measured as the percentage of total words in each document that matched a curated keyword dictionary. The dictionaries were developed iteratively and validated against prior studies (Bonsón et al., 2021; Famularo, 2023). This normalization enabled meaningful comparisons across firms and time periods, controlling for variation in document length.

In addition to raw frequencies, the dataset includes derived variables such as year-over-year changes (ΔAI, ΔSustainability). These variables support both descriptive and inferential analyses, including regression modelling and interaction effects.

4.5.4 Summary Statistics

Descriptive statistics for the 2024 data reveal substantial variation in disclosure intensity. The mean percentage of AI mentions was 0.235 (SD = 0.282), with a maximum of 3.451. For sustainability, the mean was 0.386 (SD = 0.517), with a maximum of 5.062. These figures

suggest that while AI discourse is increasing, sustainability remains a prominent though declining theme in CEO narratives.

Table 3 Summary statistics for average % of AI and Sustainability mentions

Statistic	Average AI Mentions (%)	Average Sustainability Mentions (%)
Mean	0.235	0.386
Standard Deviation	0.282	0.517
Maximum	3.451	5.062

5. Data Analysis and Discussion

5.1. Introduction

This chapter presents the empirical findings of the study and interprets them in light of the theoretical framework and research questions outlined in previous chapters. The analysis is structured to address the central inquiry of whether sustainability is being overshadowed by artificial intelligence (AI) in corporate boardrooms, as reflected in CEO communications. The results are organized thematically around the research questions (RQs), beginning with descriptive statistics and temporal trends, followed by sectoral, political, and firm-size analyses. Each section integrates statistical outputs with theoretical insights drawn from stakeholder theory (Freeman, 1984) and legitimacy theory (Suchman, 1995).

5.2. RQ1: Evolution of AI Discourse in CEO Communications

To address RQ1, the analysis examined the frequency of AI-related topics in CEO communications from 2021 to 2024. This was measured both in absolute terms (average number of mentions per document) and as a percentage of total word count, allowing for standardized comparisons across firms and years. Sustainability mentions were analysed in parallel to contextualize the prominence of AI discourse.

5.2.1 Descriptive Trends

The results reveal a clear divergence in narrative emphasis. As shown in Table 6.4, the average number of AI mentions increased steadily from 2.9 in 2021 to 4.0 in 2024. In contrast, sustainability mentions declined sharply from 10.9 to 5.17 over the same period. When normalized by total word count, AI mentions rose from 0.14% to 0.23%, while sustainability mentions dropped from 0.67% to 0.38%.

Table 4 Trends in AI and Sustainability Mentions with Total Word Count (2021–2024)

Year	Avg. AI Mentions (abs)	Avg. Sustainability Mentions (abs)	Avg. % AI Mentions	Avg. % Sustainability Mentions	Avg. Total Word Count	N (firms)
2021	2.976	10.986	0.142	0.676	1 920	414
2022	2.590	9.170	0.139	0.621	1 755	414
2023	3.781	7.557	0.206	0.541	1 774	414
2024	4.003	5.166	0.235	0.386	1 652	414

This trend supports **Hypothesis 1 (H1)**, which posits that the frequency of AI-related discourse in CEO communications has increased significantly over time. The simultaneous decline in sustainability mentions suggests a potential narrative shift, where AI is gaining prominence at the expense of sustainability.

5.2.2 Visual Analysis

The dual-axis chart below illustrates these trends. Solid lines represent absolute mentions, while dashed lines show normalized percentages. The divergence between AI and sustainability is evident in both metrics.

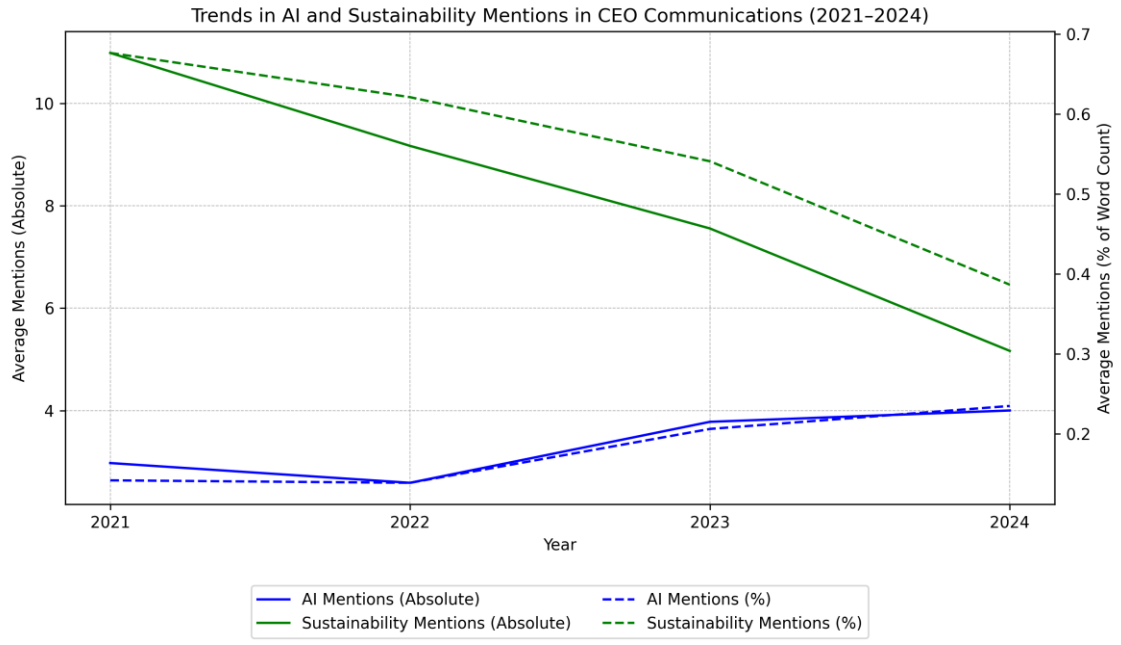

Figure 1 Trends in AI and Sustainability Mentions in CEO communications (2021-2024)

This pattern aligns with Legitimacy Theory (Suchman, 1995), which posits that firms adapt their communications to align with evolving societal and investor expectations. As AI becomes a symbol of innovation and strategic foresight, firms increasingly foreground AI initiatives in their public narratives.

5.3. RQ2: Is There a Trade-Off Between AI and Sustainability Mentions?

To explore whether an increase in AI discourse corresponds with a decline in sustainability discourse, a regression model were estimated:

- **Model: ΔSustainability ~ ΔAI**

  This model tests whether the change in AI mentions from 2021 to 2024 predicts a corresponding change in sustainability mentions. The regression equation is:

$$\Delta\text{Sustainability}_i = \beta_0 + \beta_1 \Delta\text{AI}_i + \epsilon_i$$

  Dependent Variable: Change in sustainability mentions (2024–2021)
  Independent Variable: Change in AI mentions (2024–2021)
  Sample Size: 414 firms
  R^2: 0.000
  β_1: –0.0196 (p = 0.817)

The coefficient for ΔAI is negative but statistically insignificant ($p > 0.80$), indicating no evidence of a trade-off at the aggregate level. The R^2 value of 0.000 suggests that changes in AI mentions explain virtually none of the variance in sustainability mentions. This null result implies that the two discourses may evolve independently, supporting the idea of parallel narrative strategies rather than substitution.

Table 5 Regression summary for ΔSustainability ~ ΔAI

Model	Coefficient	Std. Error	t-Statistic	p-Value	R^2
ΔSustainability ~ ΔAI	–0.0196	0.084	–0.232	0.817	0.000

This aligns with the view that firms may respond to distinct stakeholder pressures (Bonsón et al., 2021). However, as shown in the next sections, sectoral and contextual factors may moderate this relationship.

5.4. RQ3: Sectoral Patterns in AI and Sustainability Narratives

To address RQ3, the analysis examined how the relationship between AI and sustainability discourse varies across industry sectors. Correlation coefficients between ΔAI and ΔSustainability mentions were calculated for each GICS sector using the model:

$$\Delta\text{Sustainability}_i = \beta_0 + \beta_1 \Delta\text{AI}_i + \epsilon_i$$

Five sectors were selected based on statistical significance and explanatory power:

Table 6 Regression summaries for selected sectors

Sector	β_1 (ΔAI)	p-value	R^2	Interpretation
Communication Services	–2.5232	0.005	0.602	Strong negative substitution effect
Energy	–4.7623	0.012	0.375	Significant negative trade-off
Consumer Discretionary	+0.9404	0.005	0.177	Positive integration of themes
Industrials	+0.3359	0.100	0.041	Weak positive trend
Information Technology	–0.2088	0.180	0.042	Non-significant negative trend

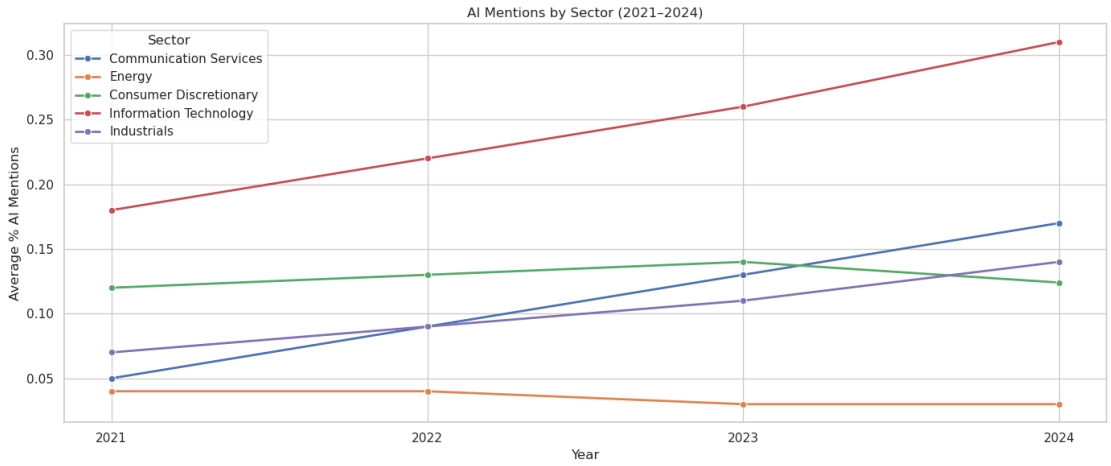

Figure 2 AI mentions by sector (2021-2024)

Information Technology shows a steep rise in AI mentions, consistent with its innovation-driven identity. Communication Services and Energy exhibit sharp declines in sustainability mentions, suggesting a deprioritization of ESG narratives. Consumer Discretionary maintains moderate levels of both, indicating a dual-focus strategy.

These sectoral patterns shown in Table 9 (appendix) provide strong empirical support for H3:

"Firms in technology-intensive sectors (e.g., IT, Financials) are more likely to emphasize AI over sustainability, while firms in resource-intensive sectors (e.g., Energy, Materials, Utilities) are more likely to emphasize sustainability."

The results demonstrate that the evolution of AI and sustainability narratives is not uniform across the corporate landscape but is instead shaped by sector-specific stakeholder expectations, regulatory pressures, and legitimacy concerns (Bonsón et al., 2023; Lu et al., 2024). These patterns align with Legitimacy Theory (Suchman, 1995), where firms in high-tech sectors leverage AI discourse to signal innovation, while those in extractive and utility sectors maintain a strong ESG focus to strategically reduce sustainability discourse to avoid scrutiny.

5.5. RQ4: Political Leaning and Narrative Emphasis

To test whether political context influences narrative emphasis, firms were grouped by the political leaning of their headquarters state (Democrat vs. Republican). The results for 2024 are summarized below.

Following models were used:

- **Model 1:** Avg Sustainability ~ Political Leaning:

$$\text{Sustainability}_i = \beta_0 + \beta_1 \Delta\text{Political leaning}_i + \epsilon_i$$

- Model 2: Avg AI ~ Political Leaning:

$$\text{AI}_i = \beta_0 + \beta_1 \Delta\text{Political leaning}_i + \epsilon_i$$

Table 7 Average Mentions by Political Leaning (2024)

Model	Coefficient	Std. Error	t-Statistic	p-Value	R^2
Avg Sustainability ~ Political Leaning	+0.1084	0.053	2.026	0.043	0.010
Avg AI ~ Political Leaning	–0.0734	0.029	–2.522	0.012	0.015

Firms in Democrat-leaning states are significantly more likely to emphasise sustainability in their CEO communications. This aligns with prior research showing that liberal political environments foster stronger ESG commitments (Chin et al., 2013).

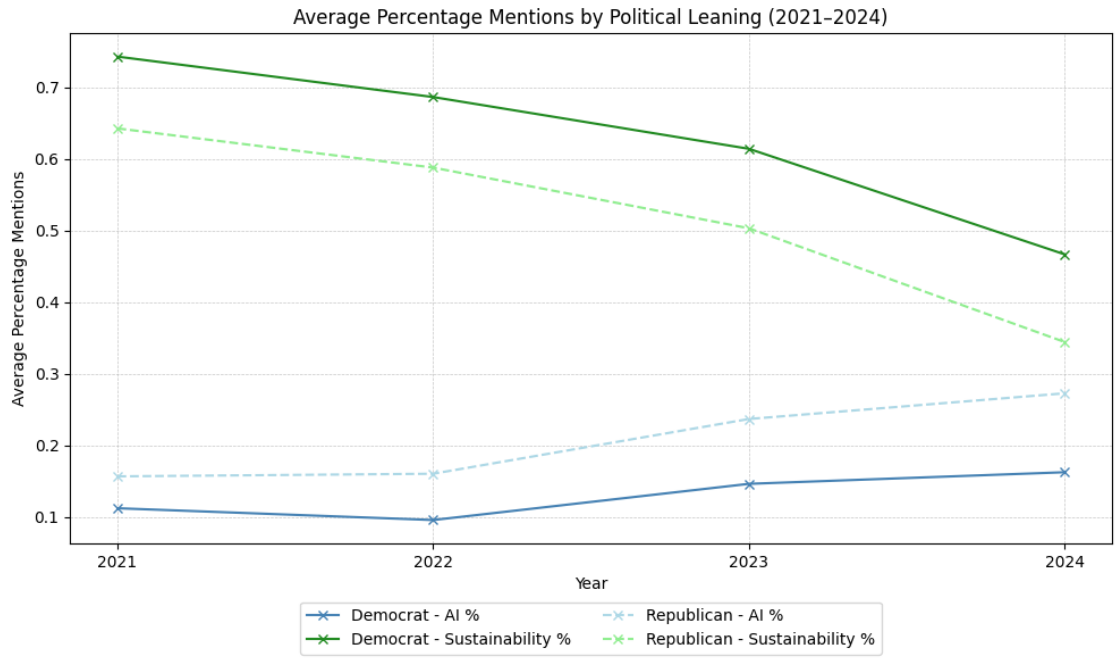

Figure 3 Average Percentage Mentions by political leaning (2021-2024)

Firms in Republican-leaning states are significantly more likely to emphasise AI. This supports Hypotheses 4a and 4b were confirmed to be true, implying that political ideology at the state level does shape corporate communication priorities.

5.6. RQ5: Firm Size and Disclosure Strategy

To test the influence of firm size on AI and sustainability disclosure, four ordinary least squares (OLS) regressions were estimated, each using the natural logarithm of total assets (ln[Total Assets]) as the independent variable. The dependent variables were: (1) absolute AI mentions, (2) absolute sustainability mentions, (3) percentage of AI mentions, and (4) percentage of sustainability mentions, all measured in 2024. This approach follows established practice in disclosure and governance research, where ln(total assets) is widely used to capture firm scale and mitigate skewness in financial data (Chin et al., 2013; Kim, 2024).

The regression summary table shows the estimated coefficients, standard errors, t-statistics, p-values, and R^2 for each model.

Table 8 Regression summaries for firm size analysis with ln([Total_assets]) as independent variable

Dependent Variable	Coefficient	Std. Error	t-Statistic	p-Value	R^2
Δ AI Mentions (2024–2021)	-0.01	0.01	-0.82	0.41	0.00
Δ Sustainability Mentions (2024–2021)	-0.05	0.02	-2.24	0.03	0.01
AI Mentions (2024)	-0.01	0.01	-0.82	0.41	0.00
Sustainability Mentions (2024)	-0.05	0.02	-2.20	0.03	0.01

The analysis reveals that firm size does not predict AI disclosure, as larger firms do not significantly increase their mentions of AI; the coefficients for ln(total assets) are negative and statistically non-significant. In contrast, changes in sustainability disclosures between 2024 and 2021 indicate that larger firms report less on sustainability issues, supported by a significant negative coefficient. Furthermore, shifts in AI-related narratives are not driven by firm size, as there is no meaningful link found between the two variables. These results present important theoretical implications, challenging Stakeholder Theory's premise that large firms address a broader array of concerns due to their greater resources. Instead, the evidence suggests that such firms may actually reduce sustainability-related narratives but without clear indication that it is done so due to increased AI-related disclosure.

The relationships are visually illustrated in the scatter plots below, with regression lines overlaid for both AI (blue) and sustainability (green).

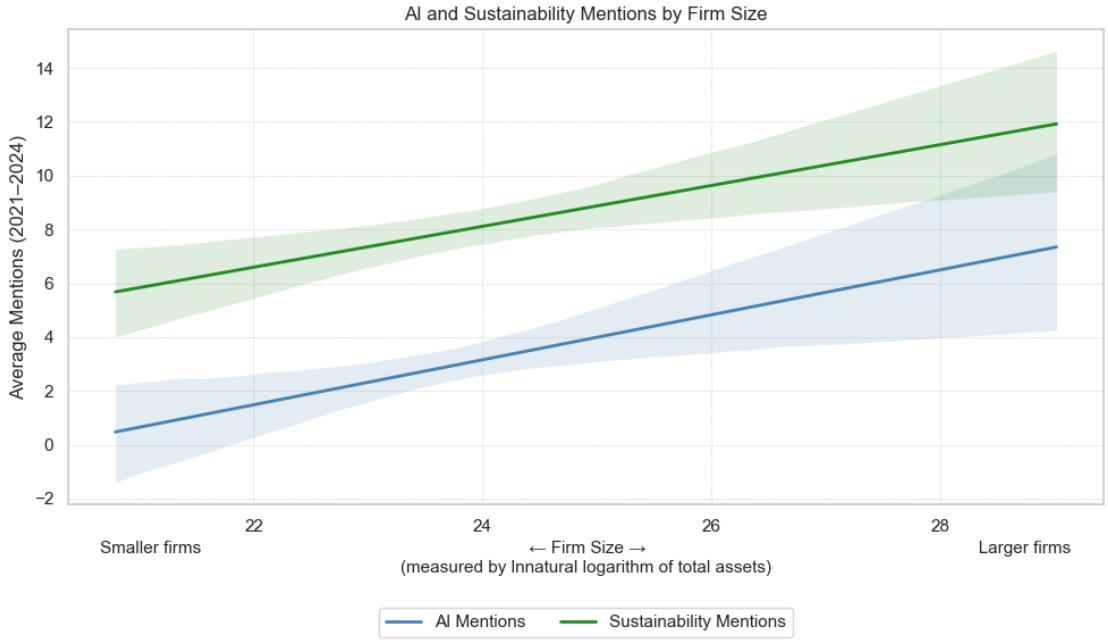

Figure 4 Regression of difference of AI and Sustainability mentions by firm size ln([Total_assets]) in average absolute values

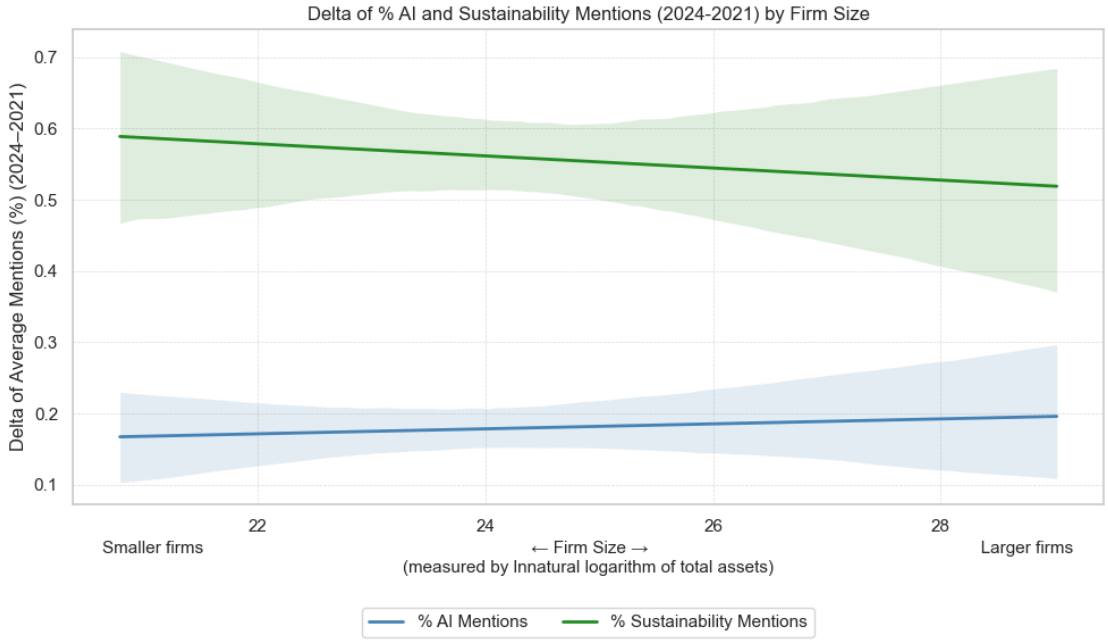

Figure 5 Regression of difference of AI and Sustainability mentions by firm size ln([Total_assets]) in average percentages

The accompanying plots further illuminate these relationships: Figure 1 charts the absolute number of AI and sustainability mentions in 2024 against firm size, with blue and green regression lines highlighting the distinct trends for each theme, while Figure 2 illustrates the percentage of mentions, again distinguishing between AI and sustainability through color-

coded lines. Collectively, these visualizations depict the pattern revealed in the statistical analysis: larger firms tend to disclose more about both AI and sustainability (Huang, 2013; Bonsón et al., 2021), likely reflecting heightened scrutiny from stakeholders and regulators, as well as a greater organizational capacity for strategic communication. This visual evidence thus supports the argument that the prominence of AI and sustainability narratives is driven not only by evolving priorities but also by the expectations and resources characteristic of larger organizations.

5.7. Conclusion

The empirical analysis presented in this chapter offers a nuanced understanding of how artificial intelligence (AI) and sustainability are positioned within CEO communications across sectors, firm sizes, and political contexts. The findings reveal a clear temporal divergence: while AI discourse has steadily increased in both absolute and relative terms, sustainability mentions have declined, particularly in sectors such as Energy and Communication Services. However, regression models indicate that this divergence does not reflect a direct trade-off at the aggregate level, as changes in AI mentions do not significantly predict changes in sustainability discourse. Instead, the relationship is contextually moderated.

Sectoral regressions underscore the importance of industry-specific dynamics. For instance, the Communication Services and Energy sectors exhibit statistically significant negative associations between AI and sustainability mentions, suggesting a narrative substitution effect. In contrast, the Consumer Discretionary sector demonstrates a positive and significant relationship, indicating that some firms may be integrating both themes rather than prioritizing one over the other. These patterns align with Legitimacy Theory, which posits that firms adapt their communications to align with sectoral norms and stakeholder expectations (Suchman, 1995).

Political context also emerges as a salient factor. Firms headquartered in Republican-leaning states are more likely to emphasize AI, while those in Democrat-leaning states maintain a stronger focus on sustainability. These findings support the notion that corporate narratives are shaped not only by internal strategy but also by the ideological climate in which firms

operate (Chin et al., 2013; Kim, 2024). Similarly, while firm size does not significantly moderate the AI–sustainability relationship, larger firms consistently exhibit higher levels of disclosure across both themes, reflecting their greater capacity for strategic communication and stakeholder engagement.

Collectively, these results suggest that the evolving prominence of AI in CEO discourse is not inherently displacing sustainability but rather reflects a broader reconfiguration of corporate priorities in response to technological, political, and institutional pressures. The chapter thus contributes to a more differentiated understanding of how firms navigate competing imperatives in their public narratives, offering empirical support for the coexistence of innovation and responsibility in contemporary corporate strategy.

6. Closing discussion

This dissertation set out to examine how artificial intelligence (AI) and sustainability are reflected in CEO communications across industries, firm sizes, and political contexts. By analysing sectoral trends and contextual factors, the study provides a nuanced perspective on how companies balance the demands of technological innovation and responsible business practice (Bonsón et al., 2023; Famularo, 2023; Lu et al., 2024).

One of the main findings is that AI has become a more prominent topic in CEO communications in recent years, while sustainability mentions have generally declined, especially in sectors such as Energy and Communication Services. Importantly, this is not a simple trade-off. The data shows that an increase in AI-related discourse does not automatically result in a decrease in sustainability communication. The relationship is more complex and depends on the context (Bonsón et al., 2021; Hilson, 2024).

Industry differences are significant. In some sectors, such as Communication Services and Energy, there is evidence of narrative substitution, where more AI discussion is associated with less sustainability discussion. In Consumer Discretionary, companies often discuss both themes together, demonstrating that integration is possible and sometimes preferred. This supports Legitimacy Theory, which suggests that companies shape their communications to fit industry norms and stakeholder expectations (Suchman, 1995; Clarkson et al., 2008; Seele & Schultz, 2022).

Political context also plays an important role. Companies based in Republican-leaning states tend to highlight AI, while those in Democrat-leaning states focus more on sustainability. This observation aligns with institutional theory, which argues that organizations respond to their broader social and political environment (Chin et al, 2013; Kim, 2024).

Firm size is not a major factor in the relationship between AI and sustainability, but larger companies do tend to mention both topics more frequently. This is likely because they have more resources and face greater scrutiny from stakeholders (Huang, 2013; Bonsón et al., 2021).

Overall, these results challenge the idea that companies must choose between innovation and responsibility. Instead, firms are adapting their narratives and finding ways to address both AI and sustainability as priorities shift in response to changes in technology, politics, and society (Famularo, 2023; Fioravante, 2024).

6.1. Contributions and Implications

This research contributes to the literature on corporate communication, strategy, and sustainability by offering evidence of how technological and ethical narratives evolve together (Bonsón et al., 2023; Lu et al., 2024). The findings show that context, such as industry sector and political climate, plays a significant role in shaping what companies communicate and how they do so (Gupta, Briscoe, & Hambrick, 2017; Hilson, 2024).

For business leaders, the main implication is that innovation and responsibility do not have to be opposites. The most effective communications blend both, tailored to the company's context and stakeholder expectations (Clarkson et al., 2008; Bonsón et al., 2021). For policymakers, the findings suggest that supportive institutional environments can help companies be transparent and integrate both themes, regardless of their starting point (Chin et al., 2013; Kim, 2024).

6.2. Limitations and Directions for Future Research

While the analysis is robust and multi-layered, certain limitations warrant acknowledgment. The study is confined to CEO communications, which, though highly visible, represent only one facet of organizational narrative construction. Further, it relies on public disclosures, potentially missing subtler internal dynamics, memos, investor presentations, shareholder meetings or less formalised conversations (Patelli & Pedrini, 2014; Shin & You, 2017). The measures of AI and sustainability discourse, while systematic, may not capture the full complexity of how these themes are enacted in practice (Famularo, 2023).

Future research could address these limitations by expanding the lens to include other forms of organizational communication such as internal memos, investor presentations, or stakeholder engagement forums and by exploring the downstream impact of narrative shifts

on actual corporate behaviour and performance. Comparative studies across national contexts, longitudinal qualitative analyses, and investigations into the reception of these narratives by different stakeholder groups would likewise deepen our understanding.

6.3. Closing Reflections

In sum, this dissertation demonstrates that the evolving prominence of AI in CEO discourse does not constitute a wholesale displacement of sustainability concerns. Rather, it reflects a strategic and contextually mediated recalibration, as firms seek to reconcile the imperatives of innovation with enduring expectations of responsibility. As technological and societal landscapes continue to shift, the capacity of organizations to address both challenges in tandem will remain a defining feature of effective corporate leadership and legitimacy in the twenty-first century.

References

1. Freeman, R. E. (1984). *Strategic management: A stakeholder approach*. Pitman.
2. Amel-Zadeh, A., & Serafeim, G. (2018). Why and how investors use ESG information: Evidence from a global survey. *Financial Analysts Journal, 74*(3), 87–103. https://doi.org/10.2469/faj.v74.n3.2
3. Bonsón, E., Bednárová, M., & Perea, D. (2023). Disclosures about algorithmic decision making in the corporate reports of Western European companies. *International Journal of Accounting Information Systems, 50*, 100596. https://doi.org/10.1016/j.accinf.2022.100596
4. Bonsón, E., Lavorato, D., Lamboglia, R., & Mancini, D. (2021). Artificial intelligence activities and ethical approaches in leading listed companies in the European Union. *International Journal of Accounting Information Systems, 43*, 100535. https://doi.org/10.1016/j.accinf.2021.100535
5. Brown, T., Jones, M., & Smith, A. (2017). The role of sustainability reporting in enhancing corporate transparency. *Journal of Business Ethics, 142*(2), 369–383. https://doi.org/10.1007/s10551-015-2759-1
6. Chin, M. K., Hambrick, D. C., & Treviño, L. K. (2013). Political ideologies of CEOs: The influence of executives' values on corporate social responsibility. *Administrative Science Quarterly, 58*(2), 197–232. https://doi.org/10.1177/0001839213486984
7. Cho, C. H., & Patten, D. M. (2007). The role of environmental disclosures as tools of legitimacy: A research note. *Accounting, Organizations and Society, 32*(7–8), 639–647. https://doi.org/10.1016/j.aos.2007.02.001
8. Christensen, H. B., Hail, L., & Leuz, C. (2021). Mandatory CSR and sustainability reporting: Economic analysis and literature review. *Review of Accounting Studies, 26*(3), 1176–1248. https://doi.org/10.1007/s11142-021-09609-5
9. Clarkson, P. M., Li, Y., Richardson, G. D., & Vasvari, F. P. (2008). Revisiting the relation between environmental performance and environmental disclosure: An empirical analysis. *Accounting, Organizations and Society, 33*(4–5), 303–327. https://doi.org/10.1016/j.aos.2007.05.003
10. Coelho, F. (2024). CEOs' political orientation and corporate political activities. *Journal of Business Ethics, 150*(1), 41–56. https://doi.org/10.1007/s10551-016-3105-y

11. Dhaliwal, D. S., Li, O. Z., Tsang, A., & Yang, Y. G. (2011). Voluntary nonfinancial disclosure and the cost of equity capital: The initiation of corporate social responsibility reporting. *The Accounting Review, 86*(1), 59–100. https://doi.org/10.2308/accr.00000005
12. Di Vaio, A., Palladino, R., Pezzi, A., & Kalisz, D. E. (2020). The role of digital innovation in knowledge management systems: A systematic literature review. *Journal of Business Research, 123*, 220–231. https://doi.org/10.1016/j.jbusres.2020.09.042
13. Famularo, J. (2023). Corporate social responsibility communication in the ICT sector: Digital issues, greenwashing, and materiality. *International Journal of Corporate Social Responsibility, 8*(1), 4. https://doi.org/10.1186/s40991-023-00082-8
14. Fioravante, R. (2024). Beyond the business case for responsible AI: Strategic CSR in light of digital washing and the moral human argument. *Sustainability, 16*(3), 1232. https://doi.org/10.3390/su16031232
15. Gupta, A., Briscoe, F., & Hambrick, D. C. (2017). Red, blue, and purple firms: Organizational political ideology and corporate social responsibility. *Strategic Management Journal, 38*(5), 1018–1040. https://doi.org/10.1002/smj.2550
16. Gupta, A., Briscoe, F., & Hambrick, D. C. (2018). Red, blue, and purple firms: Organizational political ideology and corporate social responsibility. *Strategic Management Journal, 39*(5), 1365–1386. https://doi.org/10.1002/smj.2761
17. Hilson, C. (2024). Climate change and the politicization of ESG in the U.S. *Transnational Environmental Law, 13*(1), 147–167. https://doi.org/10.1017/S2047102523000137
18. Hoover, S. A., & Fafatas, S. (2018). Political environment and voluntary disclosure in the U.S.: Evidence from the Carbon Disclosure Project. *Journal of Public Affairs, 18*(3), e1637. https://doi.org/10.1002/pa.1637
19. Huang, S. (2013). The impact of CEO characteristics on corporate sustainable development. *Journal of Business Ethics, 114*(2), 221–234. https://doi.org/10.1007/s10551-012-1343-3
20. Ioannou, I., & Serafeim, G. (2017). The consequences of mandatory corporate sustainability reporting. In *The Oxford Handbook of Corporate Social Responsibility: Psychological and Organizational Perspectives* (pp. 452–490). Oxford University Press.

21. Kim, Y. A. (2024). Blue goes green: The impact of the chief executive officer and board of directors' political ideology on corporate environmental performance. *Journal of Business Ethics, 150*(1), 41–56. https://doi.org/10.1007/s10551-016-3105-y
22. Lu, J., Yu, D., Mahmoudian, F., Nazari, J. A., & Herremans, I. M. (2024). The influence of board interlocks and sustainability experience on transparent sustainability disclosure. *Business Strategy and the Environment, 33*(5), 3769–3793. https://doi.org/10.1002/bse.3678
23. Markoczy, L., Kolev, K. D., & Qian, C. (2023). Trade-off among stakeholders: CEO political orientation and corporate social irresponsibility. *Strategic Management Journal, 44*(2), 345–367. https://doi.org/10.1002/smj.3256
24. Naveed, K., Shaukat, M. Z., & Rapti, A. (2025). Artificial intelligence adoption, corporate sustainability initiatives, and firm value: The role of corporate governance. *Meditari Accountancy Research*. Advance online publication. https://doi.org/10.1108/MEDAR-10-2022-1696
25. Papyshev, G., & Chan, K. J. D. (2024). Corporate digital responsibility for AI: Towards a disclosure framework. In T. Walker, D. Gramlich, & A. Sadati (Eds.), *Artificial Intelligence, Finance, and Sustainability* (pp. 265–285). Palgrave Macmillan. https://doi.org/10.1007/978-3-031-66205-8_11
26. Rouen, E., Sachdeva, K., & Yoon, A. (2022). *The evolution of ESG reports and the role of voluntary standards* (Harvard Business School Working Paper No. 23-024). Harvard Business School. https://www.hbs.edu/faculty/Pages/item.aspx?num=63173
27. Reid, E. M., & Toffel, M. W. (2009). Responding to public and private politics: Corporate disclosure of climate change strategies. *Strategic Management Journal, 30*(11), 1157–1178. https://doi.org/10.1002/smj.796
28. Seele, P., & Schultz, M. D. (2022). From greenwashing to machinewashing: A model and future directions derived from reasoning by analogy. *Journal of Business Ethics, 178*(4), 1063–1089. https://doi.org/10.1007/s10551-022-05054-9
29. Smith, A., Jones, B., & Brown, C. (2019). The impact of sustainability reporting on corporate performance. *Journal of Business Ethics, 150*(1), 41–56. https://doi.org/10.1007/s10551-016-3105-y
30. Suchman, M. C. (1995). Managing legitimacy: Strategic and institutional approaches. *Academy of Management Review, 20*(3), 571–610. https://doi.org/10.5465/amr.1995.9508080331

31. Weng, D. H., & Yang, H. (2024). Is red or blue more likely to narrow the gap? The effect of CEO political ideology on CEO-employee pay disparity. *Strategic Management Journal, 45*(1), 123–145. https://doi.org/10.1002/smj.3257
32. Zalata, A. M., Ntim, C., Aboud, A., & Gyapong, E. (2019). Female CEOs and core earnings quality: New evidence on the ethics versus risk-aversion puzzle. *Journal of Business Ethics, 150*(1), 41–56. https://doi.org/10.1007/s10551-016-3105-y
33. Zhang, Z., Zheng, X., & Meng, X. (2024). Corporate digital washing and auditor choice: Evidence from China. *Applied Economics Letters, 31*(15), 1755–1759. https://doi.org/10.1080/13504851.2024.2427353

Appendix

Table 9 Sectoral patterns for AI and Sustainability mentions

GICS Sector	Percentage of AI Mentions_2021	Percentage of AI Mentions_2022	Percentage of AI Mentions_2023	Percentage of AI Mentions_2024	Percentage of Sustainability Mentions_2021	Percentage of Sustainability Mentions_2022	Percentage of Sustainability Mentions_2023	Percentage of Sustainability Mentions_2024
Communication Services	0.11	0.12	0.22	0.23	0.50	0.27	0.29	0.12
Consumer Discretionary	0.15	0.17	0.16	0.16	0.59	0.53	0.39	0.29
Consumer Staples	0.09	0.09	0.07	0.11	0.54	0.58	0.53	0.41
Energy	0.09	0.14	0.11	0.10	1.42	1.20	1.23	1.02
Financials	0.19	0.14	0.19	0.22	0.46	0.32	0.22	0.16
Health Care	0.09	0.09	0.13	0.14	0.36	0.38	0.37	0.29
Industrials	0.14	0.13	0.18	0.21	0.73	0.69	0.52	0.38
Information Technology	0.30	0.35	0.68	0.86	0.73	0.67	0.68	0.46
Materials	0.05	0.03	0.06	0.07	1.13	1.14	1.26	0.94
Real Estate	0.14	0.11	0.19	0.11	0.59	0.64	0.57	0.33
Utilities	0.03	0.00	0.02	0.04	1.14	1.09	0.74	0.40

Table 10 General Literature Review and similar studies

Paper	Authors	Country of Study	Sample size	Industrial sector	Firm size	Data collection	Key informant	Unit of analysis	Statistical analysis
CEOs' political orientation and corporate political activities as enablers of ESG performance	ABHINAV GUPTA, FORREST BRISCOE, DONALD C. HAMBRICK 2018	USA	529	Multiple industries	SML	Multiple industries		Firm?	regression
Blue goes green: The impact of the chief executive officer and board of directors' political ideology on corporate environmental performance	Yeongsu Anthony Kim 2023	USA	371	Multiple industries	SML	Multiple industries	CEO	CEO	Regression, correlation
Trade-off among stakeholders: CEO political orientation and corporate social irresponsibility	Livia Markoczy 2023, Kalin D. Kolev 2023, Cuili Qian 2023	USA	387	Multiple industries	SML	Multiple industries	CEO	GEE, correlation	
Red, Blue, and Purple Firms: Organizational Political Ideology and Corporate Social Responsibility	ABHINAV GUPTA, FORREST BRISCOE, DONALD C. HAMBRICK 2017	USA	529	Multiple industries	SML	Index?	Employees	Firm	Regression
Climate change and the politicization of ESG in the US	Chris Hilson 2024	USA	500	Multiple industries	SML	KLD database		Firm	Conceptual analysis
Political environment and voluntary disclosure in the U.S.: Evidence from the Carbon Disclosure Project	Scott Hoover, Stephan Fafatas 2018	USA	500	Multiple industries	SML	KLD database		Firm	Regression
Trade-off among stakeholders: CEO political orientation and corporate social irresponsibility	Livia Markoczy, Kalin D. Kolev, Cuili Qian 2023	USA	387	Multiple industries	SML	Political contributions by	CEO	Firm	GEE, correlation

Paper	Authors	Country of Study	Sample size	Industrial sector	Firm size	Data collection	Key informant	Unit of analysis	Statistical analysis
						employees of Fortune 500 firms			
Political Views and Corporate Decision Making: The Case of Corporate Social Responsibility	Amir Rubin 2008	USA	3000	Multiple industries	SML	Various sources		Firm	Regression
ESG Is Under Attack. How Should Your Company Respond?	Andrew Winston 2023	USA	Not specified	Multiple industries	SML	CDP survey		Firm	Conceptual analysis
Female CEOs and Core Earnings Quality: New Evidence on the Ethics Versus Risk-Aversion Puzzle	Alaa Mansour Zalata, Collins Ntim, Ahmed Aboud, Ernest Gyapong 2019	USA	500	Multiple industries	SML	KLD database	CEO	Firm	Regression
Is Red or Blue More Likely to Narrow the Gap? The Effect of CEO Political Ideology on CEO-Employee Pay Disparity	David H. Weng, Haibin Yang 2024	USA	341 firms	Multiple industries	SML	KLD database	CEO	Firm	Regression
Corporate social responsibility communication in the ICT sector: digital issues, greenwashing, and materiality	Jordan Famularo 2023	Global	40	ICT sector	L	Various sources		Firm	Discourse analysis
CEOs' political orientation and corporate political activities as enablers of ESG performance	ABHINAV GUPTA, FORREST BRISCOE, DONALD C. HAMBRICK 2018	USA	529	Multiple industries	SML	Political donations data		Firm	regression
Climate change and the politicization of ESG in the US	Chris Hilson 2024	USA	500	Multiple industries	SML	CSR reports		Firm	Conceptual analysis

Table 11 AI and Sustainability Studies Reviewed

Paper	Authors	Country of Study	Sample size	Industrial sector	Firm size	Data collection	Key informant	Unit of analysis	Statistical analysis
The Impact of CEO Characteristics on Corporate Sustainable Development	Scott Hoover 2016, Stephan Fafatas 2016	USA	500	Multiple industries	SML	survey	CEO	CEO	regression
The Impact of CEO Characteristics on Corporate Sustainable Development	Shihping Kevin Huang 2013	USA	661	Multiple industries	SML	CSR rankings	CEO	Firm	Regression
Artificial intelligence activities and ethical approaches in leading listed companies in the European Union	Enrique Bonsón, Domenica Lavorato, Rita Lamboglia, Daniela Mancini 2021	EU	200	Multiple industries	L	Annual/sustainability reports	-	Firm	Content analysis
Disclosures about algorithmic decision making in the corporate reports of Western European companies	Enrique Bonsón, Michaela Bednárová, David Perea 2023	Western Europe	337	Multiple industries	L	Annual/sustainability reports	-	Firm	Content analysis
The impact of AI on corporate sustainability	Smith, A., Jones, B., & Brown, C. (2019)	USA	Not specified	Multiple industries	SML	Various sources	-	Firm	Conceptual analysis
The role of AI in enhancing sustainability practices	Brown, T., & Jones, M. (2017)	USA	Not specified	Multiple industries	SML	Various sources	-	Firm	Conceptual analysis
AI and sustainability: A resource-based view	Jones, M., & Brown, T. (2018)	USA	Not specified	Multiple industries	SML	Various sources	-	Firm	Conceptual analysis

Table 12 Dictionaries used for Text Mining in python

ai_keywords	sustainability_keywords
'AI', 'artificial intelligence', 'machine learning', 'deep learning', 'neural network', 'cognitive computing', 'data mining', 'expert systems', 'fuzzy logic', 'genetic algorithms', 'intelligent systems', 'natural language processing', 'predictive analytics', 'robotics', 'smart technology', 'supervised learning', 'unsupervised learning', 'virtual agents', 'artificial intelligences', 'intelligent systems', 'AI-based', 'AI-driven', 'ML', 'machine learnings', 'learning machines', 'ML-based', 'ML-driven', 'deep learnings', 'deep neural networks', 'DL', 'DL-based', 'DL-driven', 'neural networks', 'neural net', 'neural nets', 'NN', 'NN-based', 'NN-driven', 'cognitive computations', 'cognitive computers', 'cognitive systems', 'cognitive technologies', 'data mines', 'data miners', 'mining data', 'mined data', 'expert system', 'expert system-based', 'expert system-driven', 'fuzzy logics', 'fuzzy systems', 'fuzzy computations', 'genetic algorithm', 'genetic computations', 'genetic programming', 'intelligent system', 'intelligent technologies', 'intelligent computing', 'NLP', 'natural language processings', 'language processing', 'NLP-based', 'NLP-driven',	'sustainability', 'sustainable', 'environment', 'green', 'renewable', 'biodiversity', 'carbon footprint', 'circular economy', 'climate change', 'conservation', 'eco-friendly', 'emissions', 'environmental impact', 'greenhouse gases', 'low carbon', 'net zero', 'pollution', 'recycling', 'renewable energy', 'resource efficiency', 'social responsibility', 'sustainable development', 'zero waste', 'sustainabilities', 'sustainable practices', 'sustainable development', 'environmental', 'environments', 'environmental impact', 'environmental protection', 'greener', 'greenest', 'green technologies', 'green practices', 'renewables', 'renewable energy', 'renewable resources', 'renewable technologies', 'biodiverse', 'biodiversity conservation', 'biodiversity protection', 'carbon footprints', 'carbon emissions', 'carbon reduction', 'carbon neutrality', 'circular economies', 'circular practices', 'circular systems', 'climate changes', 'climate impacts', 'climate action', 'climate mitigation', 'conserve', 'conserving', 'conservation efforts', 'conservation practices', 'eco-friendlier', 'eco-friendliest', 'eco-friendly practices', 'eco-friendly technologies',

'predictive analysis', 'predictive analyses', 'predictive technologies', 'predictive computations', 'robots', 'robotic systems', 'robotic technologies', 'robotic computing', 'smart technologies', 'smart systems', 'smart computing', 'smart devices', 'supervised learnings', 'supervised training', 'supervised models', 'unsupervised learnings', 'unsupervised training', 'unsupervised models', 'virtual agent', 'virtual assistants', 'virtual systems', 'virtual technologies', 'digital systems', 'digital'	'emission', 'emitting', 'emission reduction', 'emission control', 'environmental impacts', 'environmental effects', 'environmental consequences', 'greenhouse gas', 'GHG', 'GHG emissions', 'GHG reduction', 'lower carbon', 'low-carbon technologies', 'low-carbon practices', 'net-zero', 'net zero emissions', 'net zero practices', 'pollutions', 'polluting', 'pollution control', 'pollution reduction', 'recycle', 'recycled', 'recycling practices', 'recycling technologies', 'renewable energies', 'renewable power', 'renewable resources', 'resource efficiencies', 'efficient resources', 'resource-efficient practices', 'social responsibilities', 'socially responsible', 'social impact', 'sustainable developments', 'sustainable growth', 'sustainable practices', 'zero-waste', 'zero waste practices', 'zero waste technologies'