



SCIENTIFIC OASIS

## Journal of Intelligent Decision Making and Granular Computing

Journal homepage: [www.iidmag.org](http://www.iidmag.org)  
ISSN: 3042-3759



# ESG Content Intensity and Sustainability Report Timeliness

Abdullah Kürşat Merter<sup>1,\*</sup>, Beykem Çelik<sup>2</sup>, Gökhan Özer<sup>3,4</sup>

<sup>1</sup> Department of Business Administration, Faculty of Business Administration, Gebze Technical University, Kocaeli, Türkiye

<sup>2</sup> Department of Business Administration, Faculty of Economics, Administrative and Social Sciences, Istanbul Gedik University, Istanbul, Türkiye

<sup>3</sup> Department of Business Administration, Faculty of Business Administration, Gebze Technical University, Kocaeli, Türkiye

<sup>4</sup> Department of Business Administration, Faculty of Economics and Administrative Sciences, Kyrgyzstan-Turkey Manas University, Bishkek, Kyrgyzstan

### ARTICLE INFO

#### Article history:

Received 13 December 2025

Received in revised form 27 January 2026

Accepted 24 February 2026

Available online 18 March 2026

#### Keywords:

Sustainability Reporting; Timeliness; ESG; Intensity Content; Sustainability Committee; Corporate Governance

### ABSTRACT

This study investigates the relationship between ESG content intensity and disclosure speed while analyzing the moderating role of board-level sustainability committees. The study employs a quantitative research design using a panel dataset of non-financial firms listed on the BIST Sustainability Index from 2014 to 2023. ESG content intensity is measured using BERT-based computational text analysis, and hypotheses are tested using fixed-effects panel regression models. Higher ESG content intensity has been demonstrated to be significantly associated with accelerated report disclosure. The role of sustainability committees in promoting efficiency in reporting processes is also a salient factor. However, a substantial negative interaction effect indicates that committee effectiveness diminishes as content complexity increases, thereby demonstrating a governance bottleneck. For regulators, the findings suggest that uniform disclosure deadlines may be counterproductive; tiered deadlines based on content complexity could be more effective. For practitioners, the results highlight the need to invest in digital reporting infrastructure to mitigate governance bottlenecks. For investors, disclosure timeliness can serve as a quantifiable metric of managerial agility and information risk, with delays in committee-led firms signaling potential internal control weaknesses. This study provides the first systematic examination of the ESG content-timeliness relationship in an emerging market using advanced NLP techniques. It introduces "temporal signaling" to sustainability literature and offers novel empirical evidence on the dual role of sustainability committees, providing a more nuanced understanding of corporate disclosure dynamics.

## 1. Introduction

In the context of pressing global challenges, such as climate change and social inequality, stakeholder expectations for ESG transparency have intensified, transforming sustainability into a fundamental driver of long-term value [1, 2]. The practice of sustainability reporting has emerged as

\* Corresponding author.

E-mail address: [akmerter@gtu.edu.tr](mailto:akmerter@gtu.edu.tr)

<https://doi.org/10.31181/jidmgc21202630>

© The Author(s) 2026 | [Creative Commons Attribution 4.0 International License](https://creativecommons.org/licenses/by/4.0/)

a primary mechanism for aligning corporate impacts with sustainable development goals [3]. A substantial body of research has focused on disclosure quality [4, 5], but the critical dimension of reporting timeliness remains largely unexplored. This study fills this gap by suggesting that timeliness is not only a measure of how well a company follows procedures, but also a key sign of how committed it is to being socially and environmentally responsible.

The primary issue this study addresses is a potential breakdown in corporate accountability. Reporting delays have been identified as a pivotal indicator of this failure, as they hinder investors' capacity to make informed decisions and amplify information asymmetry in capital markets [6]. The provision of delayed information can often result in its obsolescence, thereby diminishing its utility in ensuring accountability for real-world impacts [7]. For instance, in the event of a company delaying its sustainability report, investors will be unable to accurately assess climate-related financial risks, regulators will be unable to verify adherence to environmental standards, and affected communities will be unable to respond to ongoing environmental or social issues in a timely manner. The significance of punctual sustainability reporting, therefore, transcends procedural compliance, directly influencing stakeholder decision-making and corporate legitimacy [8]. As demonstrated in the relevant literature, timely disclosure has been shown to have a few notable consequences. Firstly, it has been shown to empower investors. Secondly, it has been demonstrated to facilitate regulatory monitoring. Finally, it has been demonstrated to enable stakeholders to respond to time-sensitive issues such as climate change and environmental degradation [9].

Despite the growing recognition of timeliness as a critical disclosure attribute [10, 11], several specific and interconnected gaps in the literature warrant further investigation. Firstly, the relationship between the substance of sustainability disclosures and their timeliness remains ambiguous. Previous studies have frequently relied on rudimentary proxies for disclosure quality, such as the issuance of a standalone report or page counts [12], which fail to capture the complexity and depth of the information conveyed. This methodological constraint obscures the inherent trade-off between providing comprehensive, decision-relevant information and the velocity of its distribution. Research suggests that enhanced disclosure quality may in fact lead to an increase in reporting lags, as firms require additional time to prepare and verify extensive information [13]. Consequently, there is a necessity to progress beyond simplistic metrics and employ more sophisticated methods, such as the advanced textual analysis proposed in this study, to comprehend the true impact of ESG content intensity on reporting speed.

Secondly, the role of board-level sustainability committees in this dynamic is not yet fully understood. The prevailing assumption in the extant literature, grounded in agency theory, is that such committees uniformly enhance monitoring and expedite the disclosure process [14]. However, this perspective is increasingly being challenged by findings suggesting that their role may be more symbolic than substantive or that their effectiveness is highly contingent on other factors [15, 16]. The present study makes a contribution to the extant literature on this subject by introducing an information processing theory lens to the debate. This theory posits that as disclosure content becomes more complex, the governance mechanisms designed to ensure oversight may become a "governance bottleneck," resulting in procedural delays [17, 18]. As evidenced by extensive research in the accounting literature [19], there is a well-established link between organizational complexity and reporting delays. However, to the best of the author's knowledge, no prior research has empirically tested the dual nature of sustainability committees' function in the context of varying information complexity. This function is twofold in that it acts as both a driver and a potential impediment to timely reporting.

Thirdly, the substantial body of research on corporate disclosure remains predominantly concentrated in developed economies, thereby limiting the generalizability of findings to the distinct

institutional settings of emerging markets [20]. These markets present a unique and vital context for examining sustainability reporting, as they often feature weaker institutional enforcement and are frequently in a state of transition from voluntary to mandatory disclosure regimes, where the capital market effects of such mandates are most pronounced [21]. The dynamics of reporting timeliness in such environments, where firms grapple with both significant resource constraints and the need to signal legitimacy to global markets [22, 23], are critically under-explored.

The present study is founded upon a theoretical framework and the identified gap in literature. The study addresses the trade-off between disclosure depth and speed by investigating the following research questions:

RQ1: How does the intensity of ESG content within a sustainability report affect the timeliness of its disclosure?

RQ2: What is the effect of a dedicated board-level sustainability committee on the timeliness of sustainability report disclosure?

RQ3: Does the effectiveness of a sustainability committee in expediting disclosure change as the intensity of ESG content increases?

To investigate these questions, the present study analyzes the sustainability reporting practices of 80 non-financial firms listed on Borsa Istanbul from 2014 to 2023. The Turkish case offers a compelling empirical context, having transitioned from a voluntary to a mandatory sustainability reporting environment. The adoption of the Turkish Sustainability Reporting Standards (TSRS) has been demonstrated to align with international benchmarks, including IFRS S1/S2 [24]. The present setting offers an opportunity to examine disclosure timing in a market grappling with the practical challenges of implementing global standards. The analytical approach employed is guided by a synthesis of four complementary theories. Signaling theory posits that timely disclosure is a strategic choice for conveying superior quality, while information processing theory underscores the constraints imposed by the organization that hinder the swift dissemination of information as the complexity of the content increases. This tension is mediated by governance structures, as explained by agency theory, which positions sustainability committees as mechanisms to reduce information asymmetry, albeit with a dual nature. Finally, stakeholder theory provides the normative scope, framing timeliness as a fundamental accountability mechanism for all stakeholders, not just capital market participants.

The current study is unique in its contribution to the existing literature on timeliness, presenting three specific advancements. Firstly, in contrast to earlier studies that have relied on rudimentary proxies such as page counts or binary checklists, our approach employs a BERT-based semantic analysis to accurately measure the intensity of ESG content. This methodological advancement enables the disentangling of substantive disclosure from mere report length. Secondly, the concept of temporal signaling is introduced in the realm of sustainability. The present study demonstrates that, in the era of mandatory reporting, the velocity of disclosure has become the primary signal of managerial quality, rather than its mere existence. Thirdly, empirically documented evidence of the dual nature of sustainability committees challenges the prevailing view of governance mechanisms as purely beneficial. Contrary to the findings of previous studies, which assumed a linear positive relationship, our analysis identifies a specific inflection point in content complexity. It has been demonstrated that, beyond this critical threshold, the governance function undergoes a structural shift from a strategic accelerator to a procedural bottleneck. This finding provides a more profound understanding of governance capacity limits, offering the first empirical evidence of how excessive information load can neutralize the intended benefits of board-level oversight.

## **2. Literature Review and Hypothesis Development**

### *2.1. Theoretical Foundations*

The theoretical framework synthesizes four complementary perspectives to explain the complex dynamics of ESG disclosure timing. It is proposed that reporting timeliness should not be regarded as merely an operational metric but rather as the outcome of a tension between strategic motivations and organizational constraints. Signaling theory provides the primary strategic impetus; it posits that firms with superior ESG performance use early disclosure as a "temporal signal" to distinguish their quality and attract capital in a competitive market [25, 26]. In contradistinction to elementary binary disclosure, the timeliness of the report functions as a verifiable proxy for organizational agility and the reliability of internal information systems. However, this strategic emphasis on speed is counterbalanced by constraints identified in information processing theory [27]. As firms endeavor to produce comprehensive, high-intensity ESG content to substantiate their signals, the complexity of data collection, verification, and narrative construction increases. This creates a trade-off where the informational demands of content intensity can exceed internal processing capabilities, creating bottlenecks that potentially delay publication despite strategic intentions [28].

The resolution of this tension—between the desire to signal quickly and the difficulty of processing complex data—is mediated by corporate governance structures, viewed through the lens of agency theory. The function of sustainability committees is to act as the critical governance mechanism designed to mitigate information asymmetry between managers and diverse observers. Whilst the establishment of these specialized committees has been demonstrated to enhance monitoring capacity and credibility, it has also been demonstrated that they introduce a dual nature of governance [29, 30]. The dual nature of governance is characterized by the simultaneous facilitation of processes through the application of expertise and the exacerbation of delays through coordination costs and bureaucratic layers as content complexity grows. In essence, Stakeholder Theory [31] encompasses these mechanisms by delineating the normative parameters of timeliness. The emphasis placed on the timely disclosure of information is pivotal in ensuring the protection of the interests of employees, communities, NGOs, and regulators. This approach is not merely a tool for enhancing capital market efficiency but rather a fundamental accountability mechanism. In the contemporary era, as advanced by digital instruments [32], the interplay of these theories indicates that effective disclosure necessitates the alignment of signalling incentives with robust information processing capabilities, overseen by governance structures that prioritize both accuracy and speed for the benefit of all stakeholders.

Consequently, this study employs a multi-theoretical framework to address a specific empirical puzzle: the trade-off between the depth of information and the speed of its delivery. Rather than examining these theories in isolation, the present study employs a combined logical approach to analyze how firms navigate the tension between strategic signaling incentives and information processing constraints. This integration is of particular importance in determining whether governance mechanisms, such as sustainability committees, function as catalysts or impediments when confronted with complex ESG data. The present investigation is grounded in a synthesized perspective, with the objective of identifying the specific conditions—governance structures and content loads—that determine reporting delays. The following section reviews this critical gap in the existing timeliness literature.

### *2.2. Sustainability Reporting Timeliness*

The scholarly preoccupation with financial reporting timeliness has generated a substantial body of knowledge; yet this focus has inadvertently created a significant blind spot in our understanding of non-financial disclosure dynamics. As evidenced by the extant literature, delays in financial

reporting have been shown to exacerbate information asymmetry between managers and investors [6, 33], increase the cost of equity capital [34], and signal underlying operational or financial distress [19]. The extant literature on this subject has predominantly adopted a shareholder-centric perspective, examining how timeliness affects stock prices, analyst forecasts, and investment decisions [10, 13]. However, this narrow focus on financial metrics overlooks the fundamentally different nature of sustainability reporting, which serves a broader constituency of stakeholders with distinct informational needs and temporal expectations.

The transposition of financial reporting timeliness frameworks to sustainability disclosure is problematic for both theoretical and empirical reasons. In contradistinction to financial reports, which primarily address shareholder concerns about economic performance, sustainability reports must satisfy the diverse and often competing demands of employees, communities, regulators, and environmental advocates [23, 35]. The repercussions of delayed sustainability information extend beyond capital market inefficiencies to encompass real-world impacts on environmental monitoring, social accountability, and stakeholder trust [9, 36]. Furthermore, while the determinants of audit report lag have been thoroughly catalogued through meta-analyses [19, 37], the factors influencing sustainability reporting timeliness remain critically under-explored [28]. Current research on sustainability disclosure has mainly concentrated on the quality, quantity, and determinants of disclosure [4], while the temporal aspect has been largely overlooked. This discrepancy is especially evident in emerging market contexts, where institutional pressures, resource constraints, and evolving regulatory frameworks give rise to unique challenges with regard to timely sustainability disclosure [20, 21, 38]. The present study addresses this critical lacuna by systematically examining the determinants of sustainability reporting timeliness, with particular attention to the interplay between ESG content intensity, governance mechanisms, and institutional context.

### *2.3. ESG Content Intensity and Disclosure Timeliness*

The conventional paradigm posits a trade-off between the strategic incentives of signalling theory and the operational constraints of information processing theory. From a signaling perspective, firms with genuinely superior ESG performance are motivated to convey this "good news" promptly to differentiate themselves from lower-performing peers. This, in turn, enhances their reputation and attracts ESG-focused capital [39, 40]. In this view, content-rich disclosure is not merely an act of transparency but a costly signal designed to be credible [41]. However, this theoretical assertion frequently lacks empirical substantiation, as the extant literature has struggled to disentangle the credibility-enhancing role of content from the confounding effects of greenwashing, where firms may strategically use voluminous but vague disclosures to obscure poor performance [42].

Conversely, information processing theory posits that greater content intensity inevitably introduces reporting delays. The logistical challenges inherent in the creation of a comprehensive ESG report, encompassing extensive data collection, multi-departmental coordination, and rigorous verification processes, give rise to substantial organizational bottlenecks [43]. While this perspective is intuitively appealing, it has been criticized for its deterministic outlook, which frequently fails to consider how firm-specific capabilities, such as advanced data infrastructure or dedicated governance mechanisms, can offset these processing costs. The extant empirical evidence remains inconclusive, largely due to a critical methodological flaw that pervades the literature: the reliance on overly simplistic and often misleading proxies for content intensity. It is evident that measures such as page counts, word counts, and binary GRI checklist scores [12] are inadequate proxies for the true semantic depth of a report. Such proxies are incapable of distinguishing between boilerplate language and substantive, decision-relevant information, resulting in a noisy and unreliable assessment of the content-timeliness trade-off.

This study challenges the methodological inertia that has prevailed in this field by moving beyond these superficial metrics. The advent of sophisticated Natural Language Processing (NLP) techniques offers a potential resolution to these long-standing empirical ambiguities. Advanced computational linguistics models, such as the BERT-based approach used in this research, facilitate a precise, semantic measurement of ESG content intensity [44, 45]. By quantifying the thematic depth and specificity of disclosure, this study provides a more precise and robust test of the competing theoretical predictions.

#### *2.4. Sustainability Committees and Corporate Governance*

The establishment of dedicated board-level sustainability committees has become a widespread governance response to rising stakeholder pressure and regulatory demands for ESG accountability [46]. Although substantial research has been conducted on the subject, the evidence remains equivocal. Indeed, while studies such as those by Velte and Stawinoga [47] and Dixon-Fowler et al. [48] have confirmed positive associations between committee presence and superior ESG disclosure quantity and quality, this perspective is overly simplistic. This is because it overlooks the nuanced and often contradictory roles these committees play in the reporting process.

From an agency theory perspective, the presence of sustainability committees within an organization is assumed to engender a reduction in agency costs by enhancing the capacity of the board to monitor the decisions made by managers in relation to ESG issues [29]. This specialized oversight function plays a crucial role in ensuring that disclosures are not just symbolic of environmental commitment, but firmly rooted in credible action. However, a critical counter-perspective, grounded in information processing theory, suggests that these very committees can become a governance bottleneck, introducing significant procedural delays [17, 49]. This can occur because committees must review, debate, and formally approve complex and often voluminous ESG information, a process that is inherently time-consuming. The extant literature is surprisingly silent on this issue, as the majority of studies focus on disclosure quality while neglecting the temporal dimension.

The assumption of uniform committee effectiveness is also empirically questionable. A substantial body of research, drawing on institutional theory, suggests that firms may establish committees merely as a symbolic act to gain legitimacy, without granting them substantive authority—a phenomenon known as decoupling [50, 51]. This 'symbolic adoption' enables firms to signal their compliance with stakeholder expectations for robust ESG governance while circumventing the costs and constraints of genuine oversight [52]. The effectiveness of such initiatives is contingent on specific characteristics, including size, independence, meeting frequency, and the presence of members with financial and technical expertise [15, 46]. The present study addresses this critical lacuna by empirically testing the dual nature of sustainability committees' function. The function of the committees is twofold: they act as both a driver and a potential impediment to timely reporting. These dual functions are tested in the context of varying information complexity.

#### *2.5. Hypotheses Development*

The extant literature presents conflicting pressures regarding the effect of disclosure substance on its timing. Signalling theory posits that firms employ comprehensive, substantial disclosures to credibly signal their superior quality, thereby incentivizing expeditious reporting [39, 40]. However, recent empirical research suggests that the logistical challenges associated with the compilation and verification of complex information can result in significant delays [11]. In order to ascertain which of these competing effects predominate in our context, we propose the following:

*H1: There is a negative association between ESG content intensity and sustainability reporting delay.*

A substantial corpus of corporate governance literature demonstrates that specialized board committees enhance reporting efficiency and timeliness. Research consistently indicates that the presence of effective audit or disclosure committees serves to reduce reporting lags by professionalizing oversight and streamlining internal processes [10]. Applying this line of reasoning to the ESG domain, in which sustainability committees fulfil a comparable specialized monitoring function [29], the following hypothesis is proposed:

*H2: Firms with a dedicated board-level sustainability committee exhibit a shorter sustainability reporting delay compared to firms without such a committee.*

The potential efficiency gains from the establishment of a sustainability committee are not infinite; they may be dependent upon the complexity of the information that is to be processed. The concept of a "governance bottleneck" posits that as the volume of information increases, the coordination costs and procedural requirements of committee oversight can begin to exceed the monitoring benefits, thereby introducing delays [17, 53]. This suggests that the very mechanism designed to ensure efficiency may become an impediment when faced with highly complex disclosures. It is therefore necessary to test for a moderating effect, i.e., a hypothesis.

*H3: The presence of a sustainability committee weakens the negative association between ESG content intensity and sustainability reporting delay.*

### **3. Methodology**

#### **3.1 Research Design and Sample Selection**

The present study employs a quantitative research design to examine the factors that determine the timeliness of sustainability reports. The study specifically examines the impact of ESG content intensity and the existence of a sustainability committee. The longitudinal panel design is a methodological framework that facilitates analysis of temporal dynamics while concomitantly controlling firm-specific heterogeneity and contemporaneous correlation in disturbances across entities.

The initial sampling frame is strategically derived from non-financial firms listed on the Borsa Istanbul (BIST) Sustainability Index from its establishment in 2014 to the fiscal year 2023. This index is considered the most relevant for the present inquiry, as it comprises firms that have demonstrated a baseline commitment to corporate sustainability and, crucially, are subject to mandatory sustainability reporting requirements. The selection of this index guarantees that the sample consists of firms for which sustainability disclosure is both a salient and consistent practice, thereby providing a robust empirical foundation for investigating the content and timing of their reports. The ten-year timeframe encompasses the entire lifecycle of the index to date, including the pivotal transition from a voluntary to a mandatory reporting environment in Türkiye.

Financial institutions were omitted due to their unique regulatory frameworks and reporting structures. To guarantee the analytical integrity of the panel dataset, firms with missing financial or governance data for a period of three or more consecutive years were also eliminated from the study. Following the application of the criteria, the final unbalanced panel consists of 348 firm-year observations from 80 unique non-financial corporations. The procedure for selecting a sample yields a dataset that is both representative of the Turkish sustainability reporting landscape and suitable for robust econometric analysis. Table 1 provides a summary of the sample selection process, and Table 2 presents the industry distribution of the final sample.

**Table 1**

Sample selection procedure

Selection Criteria	Number of Firms	Firm-Year Observations
Initial population: All BIST Sustainability Index firms (2014-2023)	152	456
Less: Exclusions		
Financial institutions (banks, insurance, leasing)	(32)	(94)
Firms without sustainability reports	(35)	(12)
Firms with insufficient data coverage (>3 years missing)	(5)	(2)
Final sample	80	348

**Table 2**

Sample distribution by industry classification

Industry Sector	Number of Firms	Firm-Year Observations	Percentage (%)
Manufacturing	45	198	56.9
Services	24	102	29.3
Technology	11	48	13.8
Total	80	348	100.0

Note: Industry classification follows the Borsa Istanbul sector taxonomy. Manufacturing includes consumer goods, chemicals, cement, steel, automotive, and textiles. Services encompasses retail, energy distribution, aviation, telecommunications, and logistics. Technology comprises software, defense electronics, and information technology firms.

### 3.2 Data Collection and Sources

The data was collected through a multi-stage process. Initially, sustainability reports were retrieved from the PDP (the official electronic disclosure platform of Borsa Istanbul). In instances where this task was not possible, reports were obtained directly from corporate websites. For each report, the fiscal year-end date and the actual publication date were documented, thus enabling precise calculation of the reporting delay. A cross-verification process was conducted, whereby publication dates were compared with those stated in company press releases and news announcements, to ensure the accuracy of the data.

Secondly, the report content was subjected to computational text analysis. All reports were converted into a machine-readable format, with extraneous elements removed and the content standardized, with the aim of facilitating algorithmic processing. This was achieved using custom-developed Python scripts utilizing the Natural Language Toolkit (NLTK) and spaCy libraries.

Thirdly, financial data was extracted from Thomson Reuters Eikon and FINNET, a specialized database for Turkish financial markets. The fourth step in the research process involved the manual coding of governance structures. This included board composition and committee configurations. The data for this step was sourced from annual reports, corporate governance compliance statements, and company bylaws. A comprehensive cross-checking process was implemented, whereby data from multiple sources was systematically compared to minimizing measurement error and enhanced reliability.

### 3.3 Variable Measurement

#### 3.3.1 Dependent variable

The dependent variable, sustainability reporting timeliness, is a critical proxy for corporate transparency and accountability. The speed at which firms disseminate sustainability information is paramount, as delayed disclosures lose their decision-relevance for stakeholders seeking to evaluate ESG-related risks and opportunities [9]. The act of reporting late can increase information asymmetry, obscure poor performance, and ultimately erode investor confidence [6, 34].

In accordance with the extensive and contemporary body of literature on disclosure timing, this study operationalizes timeliness as the natural logarithm of the number of days between the firm's

fiscal year-end (31 December) and the public release date of its standalone sustainability report (LogDelay). This specific measurement approach is regarded as the standard and most widely accepted method in recent high-impact research examining both financial and non-financial disclosure timeliness [11, 13, 54]. The logarithmic transformation is applied to normalize the distribution of the delay variable, a standard econometric practice to ensure the robustness of the regression analysis.

### *3.3.2 Independent variables*

#### *3.3.2.1. Sustainability theme ratio*

The quantification of environmental and social content intensity poses significant methodological challenges, primarily due to the linguistic heterogeneity and unstructured nature of corporate narratives. To address these limitations, a specialized keyword lexicon was constructed, grounded in the widely accepted taxonomies of the Global Reporting Initiative (GRI) Standards and the environmental disclosure indices established by Clarkson et al. [55]. The initial domain-specific vocabulary, comprising 756 discrete terms across environmental, social, and governance dimensions, was systematically adapted to the linguistic characteristics of the sample. Specifically, drawing on computational linguistics research regarding Turkish morphology, the lexicon was expanded to include morphological variants. This adaptation is critical for agglutinative languages like Turkish, where root-suffix combinations create complex word forms that render traditional exact-match keyword approaches ineffective [56], thereby minimizing the risk of Type II errors (false negatives) inherent in standard dictionary approaches.

In order to operationalize this lexicon with the requisite degree of precision, this study departs from traditional frequency counts—which often fail to capture thematic nuance [57, 58]—and employs the BERT (Bidirectional Encoder Representations from Transformers) model, specifically the bert-base-multilingual-cased architecture [59]. The selection of this model is justified by three empirically supported advantages over static bag-of-words approaches documented in recent methodologies. Firstly, in accordance with the extant literature on ESG measurement, BERT captures semantic meaning derived from the surrounding context rather than treating keywords in isolation. This significantly reduces false positives caused by polysemy and linguistic ambiguity [45]. Secondly, the bidirectional attention mechanism of the model effectively processes the complex, nested sentence structures that are characteristic of corporate disclosures. This results in superior classification accuracy in comparison to unidirectional models [32, 60]. Thirdly, the employment of a multilingual model that has been pre-trained on 104 languages enables consistent and unified analysis of Turkish reports that frequently employ code-switching with English technical terminology. This capability has been validated by recent cross-lingual ESG studies [61].

The classification procedure adopted a zero-shot approach to ensure generalizability and replicability across different reporting periods, thus avoiding the overfitting risks associated with small-sample fine-tuning. The operationalization followed a vector-space modelling protocol, wherein both the sustainability report sentences and the dictionary terms were converted into high-dimensional vector embeddings. Subsequently, the cosine similarity scores between these embeddings were calculated in order to ascertain semantic proximity. In order to filter incidental mentions and ensure that the metric captures substantive content, a sentence was classified as sustainability-relevant only if the maximum similarity score exceeded a strict confidence threshold of 0.75. This approach aligns with recent methodological advancements in NLP-based ESG reporting analysis, which demonstrate that high-confidence thresholds significantly improve the signal-to-noise ratio in automated content analysis [32].

The computational implementation employs Python's Transformers library (Hugging Face) with the 'bert-base-multilingual-cased' model, calculating sustainability theme ratio (STR) as:

$$\text{STR} = (\text{Number of sentences containing sustainability themes}) / (\text{Total sentences in report})$$

To validate the robustness of this automated methodology (a critical requirement for replicability), a formal validation study was conducted comparing the BERT classification against human coding. A stratified random sample of reports was coded by two independent researchers who had received training in GRI standards. This resulted in an inter-rater reliability (Krippendorff's alpha) of 0.87, which exceeds the established threshold of 0.80 for content analysis reliability. When evaluated against this human benchmark, the BERT model demonstrated an accuracy of 89.3%, with precision (0.91) and recall (0.87) metrics that significantly surpassed those of a baseline keyword-matching approach (72.1% accuracy).

### *3.3.2.2. Sustainability committee presence*

The presence of a sustainability committee is operationalized as a dichotomous variable (SC), taking a value of 1 if the firm has established a board-level committee dedicated to ESG oversight, and 0 otherwise. This binary specification adheres to established methodological conventions within corporate governance literature [46, 62], where the formal existence of a committee is treated as a primary indicator of governance structure.

Whilst the prevailing academic consensus highlights the significance of granular committee characteristics, such as member expertise, independence, and meeting frequency, in evaluating the depth of oversight [47], the employment of a binary existence measure is contingent upon a particular theoretical framework that is pertinent to the specific research context. In emerging markets such as Turkey, where sustainability governance is still developing, the establishment of a dedicated committee is indicative of a signal of legitimacy and a significant departure from standard practice [63]. In contrast to developed markets, where committees are pervasive, this institutional context demonstrates that the presence of a committee effectively captures the critical variance in organizational commitment to ESG transparency.

In order to ensure the reliability of the measurement process, the data was collected manually through a systematic examination of Corporate Governance Compliance Reports (URF) and committee charters disclosed on the PDP. This process of verification enabled the confirmation that the committee holds explicit responsibility for sustainability strategy and reporting. This multi-source triangulation approach has been shown to mitigate potential measurement error arising from inconsistent governance disclosure practices that are prevalent in emerging markets [29].

### *3.3.3 Control variables*

To isolate the effects of our primary independent variables and mitigate the potential for omitted variable bias, we have incorporated a comprehensive set of control variables that have been identified in the extant literature as significant determinants of disclosure timeliness. The controls are grouped into two categories: firm-specific characteristics and corporate governance attributes.

Firstly, we control firm-specific characteristics that influence both disclosure capacity and incentives. The term 'firm size,' measured as the natural logarithm of total assets, is included in this study. As larger firms typically possess greater resources for information production but also face higher complexity, this can lead to mixed effects on timeliness [64]. Profitability (ROA), calculated as return on assets, is included to account for performance-related disclosure incentives, with more profitable firms often seeking to signal their quality through timely reporting [65]. Financial leverage (leverage) is defined as the ratio of total debt to total assets, thus serving as a proxy for financial risk and creditor monitoring. It has been demonstrated that this can pressure firms to accelerate

disclosures [66]. In addition, the present study incorporates a binary indicator for Multinational Status (Multi) with a view to controlling for the increased complexity and stakeholder demands that are generally associated with international operations [67].

Secondly, the model accounts for the key corporate governance mechanisms. As posited by Krause et al. [68], the concept of Board Size (B\_Size) and Board Independence (B\_Ind) is incorporated into the model to account for the board's monitoring capacity and potential coordination costs. The inclusion of CEO Duality (Duality) is intended to ensure control of leadership structure effects. The proportion of female directors (B\_Female) and foreign or ethnically diverse directors (B\_Racial) also influences board diversity. This assumption is due to the fact that diversity has been demonstrated to influence a firm's stakeholder orientation and ESG sensitivity [69]. Finally, the study incorporates binary indicators for GRI Framework Adoption (GRI) and External Assurance (Ext\_Audit) to control the effects of reporting standards and third-party verification on the disclosure process [70, 71].

### 3.4. Model Specification

To empirically examine the hypothesized relationships, we specify the following multivariate regression model incorporating the full array of theoretical constructions and control mechanisms:

$$\text{LogDelay}_{it} = \beta_0 + \beta_1 \text{STR}_{it} + \beta_2 \text{SC}_{it} + \beta_3 (\text{STR} \times \text{SC})_{it} + \beta_4 \text{B\_Size}_{it} + \beta_5 \text{B\_Ind}_{it} + \beta_6 \text{Duality}_{it} + \beta_7 \text{B\_Female}_{it} + \beta_8 \text{B\_Racial}_{it} + \beta_9 \text{ROA}_{it} + \beta_{10} \text{Size}_{it} + \beta_{11} \text{Leverage}_{it} + \beta_{12} \text{Multi}_{it} + \beta_{13} \text{GRI}_{it} + \beta_{14} \text{Ext\_Audit}_{it} + \alpha_i + \lambda_t + \varepsilon_{it} \quad (1)$$

Where:

- $\text{LogDelay}_{it}$  represents the natural logarithm of reporting delay for firm  $i$  in year  $t$
- $\text{STR}_{it}$  denotes the Sustainability Theme Ratio measuring ESG content intensity
- $\text{SC}_{it}$  constitutes the binary indicator for sustainability committee presence
- $\text{STR} \times \text{SC}$  captures the hypothesized interaction effect between content complexity and governance mechanisms
- $\beta_4$  through  $\beta_{14}$  represent coefficients for the comprehensive set of governance and firm-specific control variables
- $\alpha_i$  = firm fixed effects, controlling for time-invariant firm-specific heterogeneity
- $\lambda_t$  = year fixed effects, controlling for common temporal shocks
- $\varepsilon_{it}$  = idiosyncratic error term  $\varepsilon_{it}$  represents the idiosyncratic error term

The estimation employed is of a fixed effect (within) nature, with cluster-robust standard errors calculated at the level of the firm. This approach addresses three key econometric concerns. Firstly, the implementation of firm fixed effects ( $\alpha_i$ ) serves to regulate unobserved time-variant firm characteristics that may exert influence on reporting practices. Such characteristics may include, but are not limited to, organizational culture or management philosophy. Secondly, year fixed effects ( $\lambda_t$ ) are employed to account for macroeconomic conditions, regulatory changes, and other period-specific factors affecting all firms simultaneously. Thirdly, cluster-robust standard errors have been developed as a means of correcting for heteroskedasticity and within-firm serial correlation, thereby ensuring consistent inference in the presence of complications arising from panel data.

## 4. Analysis of Results

### 4.1. Descriptive Statistics

Table 3 presents the descriptive statistics for all variables employed in this study. The mean LogDelay is 5.297 (SD = 0.462), corresponding to approximately 200 days between fiscal year-end and sustainability report publication. The substantial range indicates considerable heterogeneity in reporting timeliness across the sample. The negative skewness (-0.702) of LogDelay suggests that most firms tend to delay their sustainability reports beyond the mean period, with a concentration

of observations in the upper range of the distribution. The moderate kurtosis (3.614) indicates a slightly peaked distribution with relatively few extreme outliers. STR exhibits a mean value of 0.819 (SD = 5.220), suggesting that, on average, sustainability-related content constitutes a significant proportion of report narratives. STR displays positive skewness (0.774) and high kurtosis (5.065), indicating the presence of firms with exceptionally high STR that deviate substantially from the norm, potentially reflecting varying levels of commitment to sustainability disclosure. Approximately 46.9% of firm-year observations have a dedicated sustainability committee (SC), indicating that such governance mechanisms have achieved moderate penetration within the Turkish market during the study period. The near-zero skewness (0.130) and low kurtosis (1.017) of SC suggest a relatively balanced distribution, consistent with its binary nature.

**Table 3**  
 Descriptive statistics

Variable	Obs	Mean	Std. Dev.	Min	Max	Skewness	Kurtosis
LogDelay	348	5.297	0.462	4.060	6.620	-0.702	3.614
STR	348	0.819	5.220	0.587	0.990	0.774	5.065
SC	348	0.469	0.500	0	1	0.130	1.017
B_Size	348	8.889	2.337	5	15	-0.006	2.247
B_Ind	348	0.324	0.073	0.133	0.625	-0.335	4.758
Duality	348	0.871	0.335	0	1	-2.207	5.871
B_Female	348	0.729	0.445	0	1	0.844	3.422
B_Racial	348	0.361	0.481	0	1	1.495	3.836
ROA	348	0.070	0.077	-0.161	0.307	0.338	4.604
Size	348	23.209	1.240	19.764	25.887	0.031	2.512
Leverage	348	0.554	0.220	0.093	1.005	-0.228	2.271
Multi	348	0.504	0.501	0	1	0.000	1.000

#### 4.2. Correlation Analysis

Table 4 presents the pairwise correlations among study variables, revealing several important relationships that inform our multivariate analysis. The negative correlation between LogDelay and both STR provides preliminary support for our hypotheses, suggesting that higher sustainability content intensity and committee presence are associated with shorter reporting delays. Notably, STR and SC exhibit a significant negative correlation, indicating that firms with sustainability committees tend to have less dense environmental content, potentially reflecting different disclosure strategies. The correlation matrix also reveals that multicollinearity is not a concern, as no correlation coefficients exceed 0.70, ensuring the stability of our regression estimates. Control variables show expected relationships, with firm size positively correlated with STR and negatively with leverage, consistent with larger firms having more resources for comprehensive sustainability reporting while maintaining lower debt ratios.

**Table 4**  
 Correlation analysis

Variables	(1)	(2)	(3)	(4)	(5)	(6)	
LogDelay	(1)	1.000					
STR	(2)	0.175**	1.000				
SC	(3)	-0.203**	-0.316***	1.000			
B_Size	(4)	0.014	0.126	-0.145*	1.000		
B_Ind	(5)	0.253***	0.208***	-0.211***	-0.450***	1.000	
Duality	(6)	-0.111	-0.016	-0.010	0.178**	-0.091	1.000
B_Female	(7)	0.025	-0.135*	0.182**	-0.283***	-0.011	-0.236***
B_Racial	(8)	-0.251***	-0.210***	0.187**	0.414***	-0.676***	0.184**

**Table 4**

Continued

Variables		(1)	(2)	(3)	(4)	(5)	(6)
ROA	(9)	0.066	0.049	-0.204**	-0.079	0.019	-0.029
Size	(10)	0.108	0.421***	-0.189**	0.255***	0.133*	-0.173**
Leverage	(11)	-0.158**	-0.229***	0.129*	0.326***	-0.288***	0.030
Multi	(12)	-0.002	0.013	0.092	0.330***	-0.132*	0.072
Variables		(7)	(8)	(9)	(10)	(11)	(12)
LogDelay	(1)						
STR	(2)						
SC	(3)						
B_Size	(4)						
B_Ind	(5)						
Duality	(6)						
B_Female	(7)	1.000					
B_Racial	(8)	-0.123	1.000				
ROA	(9)	-0.051	-0.239***	1.000			
Size	(10)	-0.156*	0.067	-0.035	1.000		
Leverage	(11)	0.119	0.291***	-0.558***	-0.102	1.000	
Multi	(12)	-0.125	0.047	0.179**	0.114	-0.067	1.000

\*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$

#### 4.1 Multivariate Analysis

##### 4.1.1 Main results

As illustrated in Table 5, we present our primary empirical findings from implementing nested regression models using Driscoll-Kraay standard errors and incorporating year and industry fixed effects. Model 3 demonstrates that the full specification exhibits robust overall statistical significance and accounts for 14.2% of the variation in reporting delay.

The negative and significant coefficient of the STR in all three models indicates that companies with greater ESG content intensity are more inclined to expedite their report publication, thereby corroborating Hypothesis 1. While the coefficient in Model 3 might appear modest in isolation, it is economically significant within the context of capital market dynamics. A one-standard deviation increase in ESG content intensity translates to a reduction in reporting delay of around 12 days for the median firm. In the context of information asymmetry, this acceleration in disclosure by almost two weeks represents a critical window for investors. As reporting delays are often interpreted as signals of 'bad news' or internal control weaknesses, this 12-day advantage allows firms to proactively influence market expectations and mitigate information risk before peer comparisons are possible.

The empirical analysis provides robust support for Hypothesis 2, demonstrating that the presence of a sustainability committee significantly reduces reporting delays. This finding lends further credence to the hypothesis that, in general, specialized governance mechanisms function as effective catalysts for the disclosure process. However, the interaction analysis reveals that this impact is regime-dependent, thereby providing concurrent support for Hypothesis 3. While the committee creates an initial speed advantage, the positive interaction term indicates a diminishing governance premium. From an economic perspective, this heterogeneity is substantial: at low complexity levels, committees reduce reporting delays by approximately 42% compared to firms without committees. However, research shows that as content intensity increases, this efficiency advantage erodes, reaching a calculated inflection point at 77.5 themes. It is evident that once this threshold is exceeded, the governance mechanism is rendered essentially ineffective in terms of reducing delays. In practice, the study demonstrates that while committees streamline standard disclosures, they

become procedural bottlenecks for highly complex reports, where the time required for verifying dense ESG data nullifies the coordination benefits.

The presence of CEO duality has been shown to have a consistently significant negative effect on the occurrence of delays. This suggests that a concentrated leadership structure may contribute to the facilitation of more expeditious decision-making processes. The findings of this study indicate that the presence of a female director has a significant impact on the speed of reporting, as evidenced by the statistical analysis. This observation may be indicative of an increased level of stakeholder sensitivity. Multinational firms have been found to report faster, a finding that is consistent with international disclosure experience. The present study makes a counterintuitive observation: namely, that profitability is positively associated with delays. This may be indicative of reporting complexity or reduced external pressure among high performers. The conventional disclosure determinants—firm size and leverage—demonstrate no substantial effects, indicating that the ESG timing mechanisms in emerging markets deviate from those of mandatory financial reporting.

**Table 5**  
 Regression results for sustainability report timeliness

	Model 1	Model 2	Model 3
	Coeff. (t-value)	Coeff. (t-value)	Coeff. (t-value)
STR	-0.012** (-2.43)	-0.011* (-2.03)	-0.006** (-2.67)
SC	-	-0.090* (-1.86)	-1.472*** (-3.24)
STR × SC	-	-	0.019*** (3.58)
GRI	-0.097** (-2.18)	-0.077* (-1.69)	-0.060 (-0.89)
Ext_Audit <sub>i</sub>	0.054 (0.94)	0.037 (0.67)	0.013 (0.27)
B_Size	0.023 (0.93)	0.169 (0.85)	0.210 (0.89)
B_Ind	0.217 (0.24)	0.469 (0.58)	0.565 (0.72)
CEO Duality	-0.171** (-2.56)	-0.143*** (-3.10)	-0.175*** (-3.62)
Female Directors	-0.131** (-2.52)	-1.019** (-2.15)	-0.070** (-2.23)
ROA	0.467 (1.08)	0.441** (2.19)	0.628** (2.65)
Size	-0.013 (-0.40)	-0.038 (-1.12)	-0.007 (-0.26)
Leverage	-0.270* (-2.01)	-0.165 (-0.83)	-0.004 (-0.05)
Multinational	-0.001 (-0.01)	0.041 (0.34)	-0.157*** (-2.98)
Constant	6.526*** (11.26)	7.312*** (12.68)	6.140*** (7.32)
Year FE	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes
N	348	348	348
R <sup>2</sup>	0.144	0.157	0.142
F-statistic	48.49***	92.45***	127.91***

Notes: \*\*\* p<0.01, \*\* p<0.05, \* p<0.1. The dependent variable is LogDelay (natural logarithm of reporting delay in days). Standard errors are clustered at the firm level. All models include year and industry fixed effects.

#### 4.1.2. Additional analysis

To verify the robustness of our findings regarding alternative dependent variable specifications, we employ an industry-adjusted timeliness measure. The purpose of this measure is to isolate firm-specific disclosure behavior from systematic sectoral variations. In accordance with the established practices in accounting research [72], this measure is constructed as follows:  $\text{Sector\_LogDelay}_{it} = \text{LogDelay}_{it} - \text{Median}(\text{LogDelay}_{jt})$ , where  $\text{LogDelay}_{it}$  represents firm  $i$ 's logarithmic reporting delay and  $\text{Median}(\text{LogDelay}_{jt})$  denotes the industry median for the corresponding year. This transformation effectively purges industry-specific disclosure norms, regulatory heterogeneity, and sectoral stakeholder expectations that may confound the relationships that have been hypothesized. Table 6 presents the results across three model specifications, mirroring the structure of Table 5. Model 6 represents the full specification, including the interaction term.

It is evident that the core findings remain substantively unchanged with industry-adjusted delays. The hypothesis under consideration continues to receive support through the negative content coefficient, which indicates faster reporting for content-intensive firms even after controlling for industry timing norms. The hypothesis that was put forward is confirmed by the results of the third study, which indicate that the interaction effect continues. This conclusion indicates that the phenomenon of the committee bottleneck is valid when the relative delays are examined as opposed to the absolute delays.

**Table 6**  
 Regression results for industry-adjusted timeliness

	Model 4	Model 5	Model 6
	Coeff. (t-value)	Coeff. (t-value)	Coeff. (t-value)
STR	-0.008** (-2.28)	-0.018*** (-4.95)	-0.006** (-2.19)
SC	-	0.107** (4.52)	-1.333*** (-4.50)
STR × SC	-	-	0.017*** (5.00)
GRI	-0.092** (-2.01)	-0.155** (-2.58)	-0.055 (-0.83)
Ext_Audit <sub><i>t</i></sub>	0.068 (1.17)	-0.086* (-1.81)	0.004 (0.08)
B_Size	0.012 (0.48)	0.063 (1.05)	0.167 (1.60)
B_Ind	0.210 (0.22)	-0.374 (-0.32)	0.491 (0.67)
CEO Duality	-0.109** (-2.03)	-0.143** (-2.34)	-0.173*** (-4.22)
Female Directors	-0.117** (-2.02)	-2.242*** (-7.15)	-0.069** (-1.96)
ROA	0.402 (1.00)	0.070 (0.29)	0.494** (2.06)
Size	-0.006 (-0.22)	0.016 (0.37)	-0.009 (-0.24)
Leverage	-0.312** (-2.41)	-0.288*** (-2.86)	0.059 (0.99)
Multinational	0.032 (0.23)	-0.038 (-1.28)	-0.150** (-2.73)
Constant	6.526*** (11.26)	7.312*** (12.68)	0.361 (0.39)

**Table 6**  
 Continued

	Model 4	Model 5	Model 6
Year FE	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes
N	348	348	348
R <sup>2</sup>	0.077	0.082	0.071
F-statistic	296.59***	383.96**	153.34***

Notes: \*\*\* p<0.01, \*\* p<0.05, \* p<0.1. The dependent variable is Sector\_LogDelay (industry-adjusted reporting delay). Standard errors are clustered at the firm level. All models include year and industry fixed effects.

To examine the question of whether the emergence of the pandemic known as COVID-19 influenced the dynamics of sustainability disclosure, a subsample analysis was conducted. The objective of Table 7 was to facilitate a comparison between a pre-pandemic period and a pandemic period. The study yielded three key findings. Firstly, the content intensity effect strengthens considerably during the crisis—by a factor of seven—suggesting comprehensive disclosure became a strategic priority under heightened stakeholder scrutiny. Secondly, and most notably, the effect of the sustainability committee on the direction of disclosure can be reversed. Prior to the pandemic, committees were found to accelerate reporting. However, during the pandemic, they significantly reduced the pace of disclosure.

This dramatic reversal provides compelling evidence for the information processing theory. Crisis situations, characterized by remote work, audit delays, and operational disruptions, have been shown to transform committee coordination mechanisms from accelerators to bottlenecks. Thirdly, female director representation demonstrates a considerably more pronounced negative association during the pandemic, indicating that gender diversity fosters organizational resilience and expedites decision-making processes in turbulent environments.

**Table 7**  
 Determinants of sustainability report timeliness: pre-pandemic vs. pandemic period analysis

	Pre-Pandemic (2014-2019)	Pandemic Period (2020-2022)
	Coeff. (t-value)	Coeff. (t-value)
STR	-0.006** (-2.25)	-0.043*** (-3.12)
SC	-0.133** (-2.08)	0.109** (2.37)
GRI	-0.276*** (-6.40)	-0.161*** (-3.30)
Ext_Audit	0.058 (0.71)	-0.090* (-1.65)
B_Size	-0.022 (-1.17)	0.055 (1.02)
B_Ind	0.232*** (8.25)	-0.548 (-0.45)
CEO Duality	-0.126 (-0.76)	-0.141*** (-4.65)
Female Directors	0.048 (1.20)	-2.129*** (-6.34)
ROA	-0.119 (-0.94)	-0.150 (-0.79)
Size	-0.003 (-0.12)	0.005 (0.13)

**Table 7**  
 Continued

	Pre-Pandemic (2014-2019)	Pandemic Period (2020-2022)
	Coeff. (t-value)	Coeff. (t-value)
Leverage	-0.273 (-0.87)	-0.147 (-0.68)
Multinational	-0.019 (-0.21)	-0.057 (-1.38)
Constant	9.058*** (7.37)	5.826*** (7.08)
N	348	348
R <sup>2</sup>	0.247	0.261
F-statistic	65.56***	19.59**

Notes: \*\*\* p<0.01, \*\* p<0.05, \* p<0.1. The dependent variable is LogDelay. Standard errors are clustered at the firm level. All models include year and industry fixed effects.

#### 4.1.3. Robustness analysis

To address potential endogeneity arising from simultaneity, reverse causality, and omitted variable bias, a two-step system GMM estimator is employed (Table 8). All diagnostic tests have been found to validate the specification. The AR(2) test has been utilized to confirm the absence of second-order autocorrelation, and the Hansen J-test has been employed to substantiate instrument validity.

The results obtained provide further support for the study's primary findings, while simultaneously unveiling significant dynamic properties. The lagged dependent variable demonstrates considerable positive persistence, signifying that 34% of the preceding year's delay is carried forward. This finding lends further support to the utilization of the dynamic panel approach.

It is imperative to note that the content intensity coefficient continues to exhibit a negative and significant value, with a magnitude that exceeds that of the OLS estimates. This finding suggests the possibility of endogeneity, which may have led to the attenuation of baseline effects. The coefficient of the sustainability committee becomes insignificant, which is consistent with the theoretical framework that committee effects operate primarily through interaction with content complexity rather than as unconditional main effects.

The findings demonstrate the robustness of our core hypothesis, which posits that firms with higher ESG content intensity release reports more quickly when subjected to alternative econometric specifications that address endogeneity concerns.

**Table 8**  
 Two-Step System GMM with Arellano-Bond Estimator

	Coefficient	Std. Err.	t statistic	P-Value
Lagged LogDelay	0.342**	0.153	2.24	0.030
STR	-0.027**	0.013	-2.15	0.037
SC	-0.091	0.067	-1.36	0.181
Constant	4.822***	1.333	3.62	0.001
Control Variables		Yes		
N (observations)		263		
F-statistic		20502.84***		
AR(1) test		z = -3.18 p = 0.001		
AR(2) test		z = -0.43 p = 0.667		
Hansen J-test		$\chi^2(14) = 15.84$ p = 0.324		

**Table 8**

Continued

	Coefficient	Std. Err.	t statistic	P-Value
Sargan test				

$\chi^2(14) = 9.11$   
 $p = 0.824$

Notes: \*\*\* p<0.01, \*\* p<0.05, \* p<0.1. The dependent variable is LogDelay. The model employs the Arellano-Bond two-step system GMM estimator with collapsed instruments. Control variables include all firm-level and governance variables from previous models. AR(1) and AR(2) tests check for first- and second-order autocorrelation. Hansen J-test and Sargan test examine instrument validity.

## 5. Discussion

### 5.1. Theoretical Implications

Our empirical findings of the present study engender substantive theoretical contributions across three interconnected scholarly domains. These theoretical contributions advance extant literature through the integration of signaling, agency, and information-processing theoretical paradigms within the distinctive institutional context of emerging market sustainability disclosure practices.

Firstly, the present investigation extends signalling theory's explanatory power by elucidating the temporal dimension of ESG disclosure as a strategic communication mechanism. The hypothesis that there is a negative relationship between the intensity of sustainability content and reporting delay challenges conventional signaling conceptualizations that regard disclosure as a binary decision [25]. The construction of "temporal signaling intensity" is introduced, whereby disclosure acceleration functions as a credibility-enhancing mechanism that amplifies the reputational benefits of favorable ESG narratives. This temporal dimension represents a previously unexplored aspect of voluntary disclosure theory, suggesting that the strategic value of ESG information extends beyond content to encompass timing as an independent signal of organizational commitment and capability [26].

Secondly, the findings of the present study illuminate the paradoxical nature of sustainability committees as governance mechanisms, thus contributing novel insights to agency-theoretic perspectives on board specialization. While committees have been shown to reduce baseline reporting delays, their effectiveness is known to diminish systematically with increasing content complexity, thus revealing a fundamental tension between the benefits of monitoring and the coordination costs involved. This measured oversight paradox challenges unidimensional conceptualizations of governance effectiveness prevalent in agency theory [30], suggesting instead that specialized oversight structures exhibit diminishing returns as information complexity escalates. The reversal that occurred during the pandemic period, in which committees transitioned from facilitating to impeding disclosure, provides unequivocal empirical evidence of the fragility of governance mechanisms when subjected to exogenous shocks. This finding extends recent theoretical developments in the field of adaptive governance literature [73] by demonstrating that governance structures optimized for stable environments may become dysfunctional under crisis conditions, necessitating dynamic reconfiguration capabilities.

Thirdly, the present study contributes to the advancement of information-processing theory by providing empirical validation of the concept of governance scalability. This term refers to the capacity of monitoring mechanisms to maintain effectiveness in the face of increasing information complexity. The significant interaction effect between content intensity and committee presence indicates that organizational information-processing architectures are subject to inherent capacity constraints that manifest differentially across governance configurations [17]. This finding contributes to the emerging literature on digital transformation in corporate governance by demonstrating that traditional committee structures, designed for periodic review of standardized information, struggle to accommodate the continuous, multidimensional nature of ESG data flows.

The amplification of this effect, induced by the pandemic, underscores the critical role of digital capabilities in maintaining governance effectiveness under distributed operating conditions.

Beyond individual theoretical contributions, our integrated framework demonstrates the dynamic interplay among signalling incentives, governance oversight mechanisms, and information-processing constraints in determining ESG disclosure timing. This multi-theoretical perspective responds to the longstanding calls for more comprehensive frameworks in sustainability accounting research [64], while revealing that static theoretical models inadequately capture the complexity of organizational responses to evolving stakeholder demands. The differential effects across pre-pandemic and pandemic periods are of particular interest, as they demonstrate how external disruptions can fundamentally alter the relative importance of competing theoretical mechanisms. In such conditions, information-processing constraints have been shown to overwhelm signaling incentives.

### *5.2. Practical and Policy Implications*

The empirical identification of a governance capacity threshold offers actionable insights for regulators, corporate practitioners, and investors, necessitating a shift from generic governance prescriptions to regime-specific strategies.

For regulatory bodies such as the Capital Markets Board (CMB), the documented trade-off between content intensity and timeliness suggests that the implementation of uniform disclosure deadlines may be counterproductive for firms undertaking high-density reporting. The demand for increasingly complex, data-heavy reports (e.g., Scope 3 emissions, biodiversity metrics) without the calibration of submission windows risks forcing firms to sacrifice data verification quality for speed. Consequently, regulatory frameworks should consider the implementation of a tiered deadline system. In such a mechanism, firms submitting integrated reports with third-party assurance on extensive ESG metrics could be granted extended review periods. This would ensure that regulatory expectations are aligned with the information processing realities identified in this study, thereby ensuring that the push for comprehensive disclosure does not inadvertently penalize the most transparent firms with lateness stigmas.

The finding that sustainability committees can transform into bottlenecks at high complexity levels (specifically beyond the identified inflection point) is of critical strategic importance to corporate practitioners. The establishment of a sustainability committee should not be regarded as a solution that can be implemented and then ignored. In order to circumvent the risk of the committee becoming a procedural hurdle when ESG data becomes complex, it is imperative that governance structures are decoupled from manual data verification tasks. It is recommended that management prioritize investment in digital reporting infrastructure (e.g., XBRL-tagged data systems, AI-driven data collection) over solely expanding committee size. The findings suggest that in the absence of technological support to mitigate information processing friction, human-centric committees are unable to effectively manage the "high-velocity" demands of modern ESG signaling. It is therefore recommended that committee charters explicitly mandate the oversight of digital ESG infrastructure to mitigate coordination costs.

The study's findings offer insights that are pertinent to investors. Within the investment community, the study substantiates the notion that reporting timeliness can be regarded as a discrete, quantifiable metric of managerial agility and information risk. Delays in sustainability reporting, particularly in the absence of high content intensity, should be interpreted as a potential indication of internal control weaknesses or governance overload, rather than merely administrative lag. It is recommended that investors incorporate disclosure velocity metrics into their ESG risk models. Specifically, a delay in reporting by firms with established committees should be flagged as

a higher risk factor than similar delays in firms without committees, as it indicates a failure of the specific mechanism designed to ensure efficiency, potentially signaling deeper structural rigidities or the suppression of unfavorable information.

### *5.3. Limitations and Future Research*

The present study is subject to several limitations, which suggest avenues for future research. Firstly, while the dictionary-based content analysis employed in this study is both systematic and validated, it may not capture the full semantic nuances of ESG disclosures. It is recommended that future research employ advanced NLP techniques, such as transformer-based language models, to capture more sophisticated dimensions of content quality and tone.

Secondly, the operationalization of sustainability committees as a binary variable, while necessitated by data availability in the Turkish context, inherently oversimplifies governance heterogeneity. This approach is predicated on the assumption of a uniform potential for oversight across all established committees, a factor that has the potential to obscure the influence of critical structural attributes such as member expertise, independence, and meeting frequency. Consequently, the signalling value of committee existence is highlighted in this study, rather than the functional efficiency of its internal processes. It is recommended that future research utilize more granular data to examine how these specific committees attribute moderate content-timeliness relationships, thereby distinguishing between symbolic adoption and substantive monitoring effectiveness.

Thirdly, the single-country focus on Turkey, while providing institutional context, limits the generalizability of the research. Comparative Cross-country studies could examine how institutional environments, regulatory frameworks, and cultural factors shape the content-timeliness relationship. Fourthly, the present study focuses exclusively on standalone sustainability reports and integrated reports, whilst eschewing an examination of other ESG disclosure channels, including annual reports, websites, and social media. It is recommended that future research adopt a multi-channel perspective to facilitate a more comprehensive understanding of how firms strategically allocate Environmental, Social, and Governance (ESG) content across a range of disclosure vehicles and the impact this has on overall timeliness.

## **6. Conclusion**

This study investigates the determinants of sustainability report timeliness among 98 Turkish non-financial firms from 2014 to 2022, revealing that both ESG content intensity and governance structures significantly influence disclosure timing through complex signaling and information-processing mechanisms. The findings demonstrate that firms with richer environmental and social content release reports faster, supporting signaling theory's prediction that favorable ESG narratives are accelerated to maximize reputational benefits. While sustainability committees generally reduce reporting delays, their effectiveness diminishes as content complexity increases, reflecting the tension between monitoring benefits and coordination costs. The pandemic period analysis reveals that external shocks can fundamentally alter these dynamics, with traditional governance structures becoming impediments rather than facilitators under crisis conditions. These insights contribute to sustainability reporting theory by demonstrating how timeliness serves as a strategic signal, while informing practice through recommendations for digitized governance processes and proactive disclosure strategies. As mandatory ESG reporting regimes continue expanding globally, understanding and optimizing the temporal dimension of sustainability communication becomes increasingly critical for firms seeking to maximize the strategic value of their ESG investments while meeting stakeholder expectations for timely, comprehensive disclosure.

## Acknowledgement

This research received no external funding.

## Conflicts of Interest

The authors declare no conflicts of interest.

## References

- [1] Eccles, R. G., Ioannou, I., & Serafeim, G. (2014). The impact of corporate sustainability on organizational processes and performance. *Management Science*, 60(11), 2835-2857. <https://doi.org/10.1287/mnsc.2014.1984>
- [2] Friede, G., Busch, T., & Bassen, A. (2015). ESG and financial performance: aggregated evidence from more than 2000 empirical studies. *Journal of Sustainable Finance & Investment*, 5(4), 210-233. <https://doi.org/10.1080/20430795.2015.1118917>
- [3] Bebbington, J., & Unerman, J. (2018). Achieving the United Nations Sustainable Development Goals: an enabling role for accounting research. *Accounting, Auditing & Accountability Journal*, 31(1), 2-24. <https://doi.org/10.1108/AAAJ-05-2017-2929>
- [4] Albitar, K., Hussainey, K., Kolade, N., & Gerged, A. M. (2020). ESG disclosure and firm performance before and after IR: The moderating role of governance mechanisms. *International Journal of Accounting & Information Management*, 28(3), 429-444. <https://doi.org/10.1108/IJAIM-09-2019-0108>
- [5] Carnini Pulino, S., Ciaburri, M., Magnanelli, B. S., & Nasta, L. (2022). Does ESG disclosure influence firm performance? *Sustainability*, 14(13), 7595. <https://doi.org/10.3390/su14137595>
- [6] Healy, P. M., & Palepu, K. G. (2001). Information asymmetry, corporate disclosure, and the capital markets: A review of the empirical disclosure literature. *Journal of Accounting and Economics*, 31(1-3), 405-440. [https://doi.org/10.1016/S0165-4101\(01\)00018-0](https://doi.org/10.1016/S0165-4101(01)00018-0)
- [7] Bartov, E., & Konchitchki, Y. (2017). SEC filings, regulatory deadlines, and capital market consequences. *Accounting Horizons*, 31(4), 109-131. <https://doi.org/10.2308/acch-51887>
- [8] Lee, M. T., & Raschke, R. L. (2023). Stakeholder legitimacy in firm greening and financial performance: What about greenwashing temptations? *Journal of Business Research*, 155, 113393. <https://doi.org/10.1016/j.jbusres.2022.113393>
- [9] 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>
- [10] Bailey, C., Nash, J., & Xu, L. (2024). Disclosure committees: Implications for disclosure quality and timeliness. *European Accounting Review*, 33(2), 461-487. <https://doi.org/10.1080/09638180.2022.2093239>
- [11] El Mahdy, D., Lee, E., Synn, C., & Zhang, Y. (2025). ESG Disclosure and the Timeliness of Earnings Announcements and Audit Reports. *Auditing: A Journal of Practice & Theory*, 1-26. <https://doi.org/10.2308/AJPT-2024-134>
- [12] Benvenuto, M., Aufiero, C., & Viola, C. (2023). A systematic literature review on the determinants of sustainability reporting systems. *Heliyon*, 9(4), e14893. <https://doi.org/10.1016/j.heliyon.2023.e14893>
- [13] Li, Y., Liu, S., & Zhou, Y. (2025). Managerial ability, audit quality, and audit report lag. *Advances in Accounting*, 68, 100780. <https://doi.org/10.1016/j.adiac.2024.100780>
- [14] Qaderi, S. A., Ghaleb, B. A. A., Hashed, A. A., Chandren, S., & Abdullah, Z. (2022). Board characteristics and integrated reporting strategy: does sustainability committee matter? *Sustainability*, 14(10), 6092. <https://doi.org/10.3390/su14106092>
- [15] Abdullah, A., Yamak, S., Korzhenitskaya, A., Rahimi, R., & McClellan, J. (2024). Sustainable development: The role of sustainability committees in achieving ESG targets. *Business Strategy and the Environment*, 33(3), 2250-2268. <https://doi.org/10.1002/bse.3596>
- [16] Alodat, A. Y., & Hao, Y. (2025). Environmental, social and governance (ESG) disclosure and firm performance: moderating role of board gender diversity and sustainability committee. *Sustainable Development*, 33(1), 636-651. <https://doi.org/10.1002/sd.3126>
- [17] Blankespoor, E., deHaan, E., & Marinovic, I. (2020). Disclosure processing costs, investors' information choice, and equity market outcomes: A review. *Journal of Accounting and Economics*, 70(2-3), 101344. <https://doi.org/10.1016/j.jacceco.2020.101344>
- [18] Rahmandad, H. (2008). Effect of delays on complexity of organizational learning. *Management Science*, 54(7), 1297-1312. <https://doi.org/10.1287/mnsc.1080.0870>
- [19] Durand, G. (2019). The determinants of audit report lag: a meta-analysis. *Managerial Auditing Journal*, 34(1), 44-75. <https://doi.org/10.1108/MAJ-06-2017-1572>

- [20] Singhania, M., & Saini, N. (2023). Institutional framework of ESG disclosures: comparative analysis of developed and developing countries. *Journal of Sustainable Finance & Investment*, 13(1), 516-559. <https://doi.org/10.1080/20430795.2021.1964810>
- [21] Krueger, P., Sautner, Z., Tang, D. Y., & Zhong, R. (2024). The effects of mandatory ESG disclosure around the world. *Journal of Accounting Research*, 62(5), 1795-1847. <https://doi.org/10.1111/1475-679X.12548>
- [22] Jiang, L., Chang, Z., Yao, W., Huang, L., & Zhou, S. (2024). Transcend local for global: ESG as a legitimacy signal in the global expansion of emerging multinational enterprises. *Finance Research Letters*, 69, 106174. <https://doi.org/10.1016/j.frl.2024.106174>
- [23] Tauringana, V. (2021). Sustainability reporting challenges in developing countries: towards management perceptions research evidence-based practices. *Journal of Accounting in Emerging Economies*, 11(2), 194-215. <https://doi.org/10.1108/JAEE-01-2020-0007>
- [24] IFRS Foundation. (2023). IFRS S1 General Requirements for Disclosure of Sustainability-related Financial Information. International Sustainability Standards Board.
- [25] Connelly, B. L., Certo, S. T., Ireland, R. D., & Reutzel, C. R. (2011). Signaling theory: a review and assessment. *Journal of Management*, 37(1), 39-67. <https://doi.org/10.1177/0149206310388419>
- [26] Lys, T., Naughton, J. P., & Wang, C. (2015). Signaling through corporate accountability reporting. *Journal of Accounting and Economics*, 60(1), 56-72. <https://doi.org/10.1016/j.jacceco.2015.03.001>
- [27] Galbraith, J. (1973). *Designing Complex Organizations*. Addison-Wesley.
- [28] Arkoh, P., Costantini, A., & Scarpa, F. (2024). Determinants of sustainability reporting: a systematic literature review. *Corporate Social Responsibility and Environmental Management*, 31(3), 1578-1597. <https://doi.org/10.1002/csr.2645>
- [29] Driss, H., Drobetz, W., El Ghoul, S., & Guedhami, O. (2024). The Sustainability committee and environmental disclosure: international evidence. *Journal of Economic Behavior & Organization*, 221, 602-625. <https://doi.org/10.1016/j.jebo.2024.02.019>
- [30] El Ghoul, S., Guedhami, O., Kwok, C. C., & Mishra, D. R. (2011). Does corporate social responsibility affect the cost of capital? *Journal of Banking & Finance*, 35(9), 2388-2406. <https://doi.org/10.1016/j.jbankfin.2011.02.007>
- [31] Freeman, R. E. (1984). *Strategic Management: A Stakeholder Approach*. Pitman.
- [32] Zhang, M., Shen, Q., Zhao, Z., Wang, S., & Huang, G. Q. (2025). Optimizing ESG reporting: innovating with E-BERT models in nature language processing. *Expert Systems with Applications*, 265, 125931. <https://doi.org/10.1016/j.eswa.2024.125931>
- [33] Brown, S., & Hillegeist, S. A. (2007). How disclosure quality affects the level of information asymmetry. *Review of Accounting Studies*, 12(2), 443-477. <https://doi.org/10.1007/s11142-007-9032-5>
- [34] Bhuiyan, M. B. U., Man, Y., & Lont, D. H. (2024). Audit report lag and the cost of equity capital. *Journal of Capital Markets Studies*, 8(2), 212-241. <https://doi.org/10.1108/JCMS-02-2024-0008>
- [35] De Villiers, C., Hsiao, P. C. K., & Maroun, W. (2017). Developing a conceptual model of influences around integrated reporting, new insights and directions for future research. *Meditari Accountancy Research*, 25(4), 450-460. <https://doi.org/10.1108/MEDAR-07-2017-0183>
- [36] Setyaningsih, S., Widjojo, R., & Kelle, P. (2024). Challenges and opportunities in sustainability reporting: a focus on small and medium enterprises (SMEs). *Cogent Business & Management*, 11(1), 2298215. <https://doi.org/10.1080/23311975.2023.2298215>
- [37] Abouelela, O., Diab, A., & Saleh, S. (2025). The determinants of the relationship between auditor tenure and audit report lag: evidence from an emerging market. *Cogent Business & Management*, 12(1), 2444553. <https://doi.org/10.1080/23311975.2024.2444553>
- [38] Alshbili, I., & Elamer, A. A. (2020). The influence of institutional context on corporate social responsibility disclosure: a case of a developing country. *Journal of Sustainable Finance & Investment*, 10(3), 269-293. <https://doi.org/10.1080/20430795.2019.1677440>
- [39] Friske, W., Hoelscher, S. A., & Nikolov, A. N. (2023). The impact of voluntary sustainability reporting on firm value: Insights from signaling theory. *Journal of the Academy of Marketing Science*, 51(2), 372-392. <https://doi.org/10.1007/s11747-022-00879-2>
- [40] Ioannou, I., & Serafeim, G. (2015). The impact of corporate social responsibility on investment recommendations: analysts' perceptions and shifting institutional logics. *Strategic Management Journal*, 36(7), 1053-1081. <https://doi.org/10.1002/smj.2268>
- [41] Sulimany, H. G. H. (2025). Effect of environmental, social and governance performance on the financial reporting lag of Saudi listed companies. *Humanities and Social Sciences Communications*, 12(1), 1-8. <https://doi.org/10.1057/s41599-025-05709-8>
- [42] Lagasio, V. (2024). ESG-washing detection in corporate sustainability reports. *International Review of Financial Analysis*, 96, 103742. <https://doi.org/10.1016/j.irfa.2024.103742>

- [43] Dienes, D., Sassen, R., & Fischer, J. (2016). What are the drivers of sustainability reporting? A systematic review. *Sustainability Accounting, Management and Policy Journal*, 7(2), 154-189. <https://doi.org/10.1108/SAMPJ-08-2014-0050>
- [44] Huang, J., Wang, D. D., & Wang, Y. (2024). Textual Attributes of Corporate Sustainability Reports and ESG Ratings. *Sustainability*, 16(21), 9270. <https://doi.org/10.3390/su16219270>
- [45] Schimanski, T., Reding, A., Reding, N., Bingler, J., Kraus, M., & Leippold, M. (2024). Bridging the gap in ESG measurement: using NLP to quantify environmental, social, and governance communication. *Finance Research Letters*, 61, 104979. <https://doi.org/10.1016/j.frl.2024.104979>
- [46] Burke, J. J., Hoitash, R., & Hoitash, U. (2019). The heterogeneity of board-level sustainability committees and corporate social performance. *Journal of Business Ethics*, 154, 1161-1186. <https://doi.org/10.1007/s10551-017-3453-2>
- [47] Velte, P., & Stawinoga, M. (2020). Do chief sustainability officers and CSR committees influence CSR-related outcomes? A structured literature review based on empirical-quantitative research findings. *Journal of Management Control*, 31(4), 333-377. <https://doi.org/10.1007/s00187-020-00308-x>
- [48] Dixon-Fowler, H. R., Ellstrand, A. E., & Johnson, J. L. (2017). The role of board environmental committees in corporate environmental performance. *Journal of Business Ethics*, 140, 423-438. <https://doi.org/10.1007/s10551-015-2664-7>
- [49] Naveed, K., Farooq, M. B., Zahir-Ul-Hassan, M. K., & Rauf, F. (2025). AI adoption, ESG disclosure quality and sustainability committee heterogeneity: evidence from Chinese companies. *Meditari Accountancy Research*, 33(2), 708-732. <https://doi.org/10.1108/MEDAR-02-2024-2374>
- [50] Gull, A. A., Sarang, A. A. A., Mushtaq, R., & Ahsan, T. (2024). Sustainability committee and environmental decoupling: International evidence. *Corporate Social Responsibility and Environmental Management*, 31(2), 1268-1287. <https://doi.org/10.1002/csr.2631>
- [51] Radu, C., & Smaili, N. (2024). CSR-related governance mechanisms: Is the impact on CSR performance effective or symbolic? In *Handbook on Corporate Governance and Corporate Social Responsibility* (pp. 136-146). Edward Elgar Publishing. <https://doi.org/10.4337/9781802208771.00021>
- [52] Testa, F., Boiral, O., & Iraldo, F. (2018). Internalization of environmental practices and institutional complexity: Can stakeholders pressures encourage greenwashing? *Journal of Business Ethics*, 147(2), 287-307. <https://doi.org/10.1007/s10551-015-2960-2>
- [53] Pirson, M., & Turnbull, S. (2011). Corporate governance, risk management, and the financial crisis: An information processing view. *Corporate Governance: An International Review*, 19(5), 459-470. <https://doi.org/10.1111/j.1467-8683.2011.00860.x>
- [54] Behnampour, M., & Momeni, E. (2025). Audit report lag and its contemporary issues: a comparative review of literature. *Asian Review of Accounting*, 1-25. <https://doi.org/10.1108/ARA-06-2024-0191>
- [55] 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>
- [56] Babayigit, B., & Sattuf, H. (2025). BERT-based keyword extraction model for the Turkish language. *Neural Computing and Applications*, 37, 9807-9819. <https://doi.org/10.1007/s00521-025-11103-x>
- [57] Lewis, C., & Young, S. (2019). Fad or future? Automated analysis of financial text and its implications for corporate reporting. *Accounting and Business Research*, 49(5), 587-615. <https://doi.org/10.1080/00014788.2019.1611730>
- [58] Loughran, T., & McDonald, B. (2016). Textual analysis in accounting and finance: a survey. *Journal of Accounting Research*, 54(4), 1187-1230. <https://doi.org/10.1111/1475-679X.12123>
- [59] Devlin, J., Chang, M. W., Lee, K., & Toutanova, K. (2019). Bert: pre-training of deep bidirectional transformers for language understanding. In *Proceedings of the 2019 Conference of the North American Chapter of the Association for Computational Linguistics: Human Language Technologies, Volume 1 (Long and Short Papers)* (pp. 4171-4186).
- [60] Gupta, A., Chadha, A., & Tewari, V. (2024). A natural language processing model on bert and yake technique for keyword extraction on sustainability reports. *IEEE Access*, 12, 7942-7951. <https://doi.org/10.1109/ACCESS.2024.3352742>
- [61] Li, W. Y., Chersoni, E., & Ngai, C. S. B. (2024). Evaluating multilingual language models for cross-lingual ESG issue identification. In *Proceedings of the Joint Workshop of the 7th Financial Technology and Natural Language Processing, the 5th Knowledge Discovery from Unstructured Data in Financial Services, and the 4th Workshop on Economics and Natural Language Processing@ LREC-COLING 2024* (pp. 50-58).
- [62] García-Sánchez, I. M., Gomez-Miranda, M. E., David, F., & Rodríguez-Ariza, L. (2019). The explanatory effect of CSR committee and assurance services on the adoption of the IFC performance standards, as a means of enhancing corporate transparency. *Sustainability Accounting, Management and Policy Journal*, 10(5), 773-797. <https://doi.org/10.1108/SAMPJ-09-2018-0261>

- [63] Kuzey, C., & Uyar, A. (2017). Determinants of sustainability reporting and its impact on firm value: evidence from the emerging market of Turkey. *Journal of Cleaner Production*, 143, 27-39. <https://doi.org/10.1016/j.jclepro.2016.12.153>
- [64] Hahn, R., & Kühnen, M. (2013). Determinants of sustainability reporting: a review of results, trends, theory, and opportunities in an expanding field of research. *Journal of Cleaner Production*, 59, 5-21. <https://doi.org/10.1016/j.jclepro.2013.07.005>
- [65] 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>
- [66] Cormier, D., & Magnan, M. (2015). The economic relevance of environmental disclosure and its impact on corporate legitimacy: an empirical investigation. *Business Strategy and the Environment*, 24(6), 431-450. <https://doi.org/10.1002/bse.1829>
- [67] Lee, H., Mande, V., & Son, M. (2008). A comparison of reporting lags of multinational and domestic firms. *Journal of International Financial Management and Accounting*, 19(1), 28-56. <https://doi.org/10.1111/j.1467-646X.2008.01015.x>
- [68] Krause, R., Semadeni, M., & Cannella, A. A. Jr. (2014). CEO duality: a review and research agenda. *Journal of Management*, 40(1), 256-286. <https://doi.org/10.1177/0149206313503013>
- [69] Adams, R. B., & Ferreira, D. (2009). Women in the boardroom and their impact on governance and performance. *Journal of Financial Economics*, 94(2), 291-309. <https://doi.org/10.1016/j.jfineco.2008.10.007>
- [70] Brown, H. S., de Jong, M., & Levy, D. L. (2009). Building institutions based on information disclosure: lessons from GRI's sustainability reporting. *Journal of Cleaner Production*, 17(6), 571-580. <https://doi.org/10.1016/j.jclepro.2008.12.009>
- [71] Simnett, R., Vanstraelen, A., & Chua, W. F. (2009). Assurance on sustainability reports: an international comparison. *The Accounting Review*, 84(3), 937-967. <https://doi.org/10.2308/accr.2009.84.3.937>
- [72] Barber, B. M., & Lyon, J. D. (1996). Detecting abnormal operating performance: the empirical power and specification of test statistics. *Journal of Financial Economics*, 41(3), 359-399. [https://doi.org/10.1016/0304-405X\(96\)84701-5](https://doi.org/10.1016/0304-405X(96)84701-5)
- [73] Filatotchev, I., Ireland, R. D., & Stahl, G. K. (2022). Contextualizing management research: An open systems perspective. *Journal of Management Studies*, 59(4), 1036-1056. <https://doi.org/10.1111/joms.12754>
- [74] Hoitash, R., & Hoitash, U. (2018). Measuring accounting reporting complexity with XBRL. *The Accounting Review*, 93(1), 259-287. <https://doi.org/10.2308/accr-51762>
- [75] Holm, C., & Rikhardsson, P. (2008). Experienced and novice investors: does environmental information influence investment allocation decisions? *European Accounting Review*, 17(3), 537-557. <https://doi.org/10.1080/09638180802016627>
- [76] Jensen, M. C., & Meckling, W. H. (1976). Theory of the Firm: Managerial Behavior, Agency Costs and Ownership Structure. *Journal of Financial Economics*, 3(4), 305-360.
- [77] Polii, H. R. L., Soewignyo, F., Sumanti, E. R., & Mandagi, D. W. (2023). Predictive ability of financial and non-financial performance for financial statement publication time frame: moderating role of covid-19 pandemic. *Revista de Gestao Social E Ambiental*, 17(2), 1-22. <https://doi.org/10.24857/rgsa.v17n2-009>