

Beyond ESG Disclosure: How Biostatistical Capability Strengthens Corporate Legitimacy through Credible ESG Reporting

Mohammed Abdullah Ammer ^{1*}, Chok Nyen Vui²

¹ Department of Finance, School of Business, King Faisal University, Al-Ahsa 31982, Saudi Arabia; ² Dean, Faculty of Business, SEGi University, Taman Sains Selangor, Kota Damansara PJU 5, 47810 Petaling Jaya, Selangor, Malaysia

ABSTRACT

This study investigates how biostatistical analysis enhances corporate legitimacy through credible Environmental, Social, and Governance (ESG) data reporting, stakeholder trust, and corporate reputation. It proposes and empirically tests a sequential framework grounded in Legitimacy Theory to explain the strategic role of analytical capability in strengthening organizational legitimacy. A quantitative cross-sectional research design was employed using a structured questionnaire comprising previously validated measurement scales. The measurement model was assessed through reliability, convergent validity, discriminant validity, and multicollinearity tests, while the structural model was evaluated using bootstrapping. The results reveal that biostatistical analysis significantly improves ESG data reporting, which subsequently enhances stakeholder trust. Stakeholder trust positively influences both corporate reputation and corporate legitimacy, while corporate reputation further strengthens corporate legitimacy. In addition, corporate reputation significantly mediates the relationship between stakeholder trust and corporate legitimacy, supporting the proposed sequential framework. This study is among the first to integrate biostatistical analysis, ESG data reporting, stakeholder trust, corporate reputation, and corporate legitimacy into a single theoretical framework. The findings extend Legitimacy Theory by demonstrating how analytical capability serves as a strategic organizational resource that improves the credibility of ESG reporting and ultimately reinforces long-term corporate legitimacy.

ARTICLE HISTORY

Received May 09, 2026

Accepted July 15, 2026

KEYWORDS

Biostatistical Analysis,
ESG Data Reporting,
Stakeholder Trust,
Corporate Reputation,
Corporate Legitimacy,
Legitimacy Theory

1. Introduction

The reporting of Environmental, Social and Governance (ESG) issues is now a key tool organizations use to show their sustainability efforts (Camilleri, 2026). High quality ESG reporting has the benefit of not only complying with regulatory requirements (Cepêda et al., 2026), but also allowing companies to report on non-financial data that would demonstrate their environmental responsibility, social impact and governance processes. With increasing demand for ESG data to assess an organizational performance from stakeholders (Raghuvanshi et al., 2026), it is now as essential that the information is credible as the disclosure itself. Thus, organizations are predicted not only to make ESG disclosures but to ensure that the disclosure is accurate, transparent and underpinned by a robust analytical process.

While there is more focus on ESG reporting, the reliability and credibility of sustainability information is still a major problem (Nuraini & Amrulloh, 2024). Stakeholder trust in ESG disclosures can be undermined by a lack of analytical rigor, and inconsistent measurement practices and subjective assessments (Ganc et al., 2026). The increased requirement for strong analytical skills has overlapped with greater demand for high-quality analytical tools to help enhance ESG data quality and evidence-based sustainability reporting. Biostatistical analysis provides systematic processes for collecting, validating and interpreting complex datasets (Rahnenführer et al., 2023) which will help organizations generate more reliable and consistent ESG data. The purpose of this paper is to discuss the importance of biostatistical ability in enhancing ESG reporting, revealing that this aspect has received little attention in the literature.

The promise of credible ESG reporting is that it will create wider benefits for the organization beyond compliance (Gazzola et al., 2026). If stakeholders believe sustainability disclosures are credible and transparent (Fagbemi et al., 2025), they are more likely to build their confidence in the organization, which leads to improved stakeholder trust (Liang et al.,

2025). This boosts the reputation of the company and helps build positive stakeholder perceptions of the company competence, integrity, and commitment to sustainability over the long term (Singh & Arora, 2025). At the same time, a positive corporate image enhances corporate legitimacy through the reinforcement of acceptance and the legitimacy of the organization in society (Lim & Zhang, 2025). While some studies have studied the concept of ESG reporting (Darnall et al., 2022; Diwan & Amarayil Sreeraman, 2024; Sundarasan et al., 2026), some others have investigated stakeholder trust, corporate reputation, and corporate legitimacy. However, these previous studies have not simultaneously explored the relationship between the biostatistical capability and how it helps to build the legitimacy of an organization through credible ESG reporting.

This study fills this gap by suggesting and testing an innovative sequential model between biostatistical capability, ESG data reporting, trust, corporate reputation, and corporate legitimacy. In particular, this research examines whether the use of biostatistics can improve the quality of ESG data reporting. The credible and meaningful ESG reporting can strengthen stakeholder trust which can increase corporate reputation and corporate legitimacy. In addition, this study looks at the mediation effect of corporate reputation between stakeholder trust and corporate legitimacy. Additionally, this research is a combination of these relationships integrated in one conceptual model and it expands the knowledge of analytical capabilities in sustainability communication and organizational legitimacy. The results will offer theoretical understanding of the strategic importance of biostatistical skills for ESG reporting, as well as practical advice for companies wishing to increase the certainty of information and build stakeholder trust and corporate reputation through credible sustainability reporting.

2. Hypotheses Development

2.1 Effect of Biostatistical Analysis on ESG Data Reporting

Biostatistical analysis is a systematic use of statistical methods to gather, validate, analyze and interpret complex data sets to inform decisions based on evidence (Usha et al., 2026). It improves the quality of data, helps prevent inconsistencies and inaccuracies, and facilitates stringent data validation processes (MacFarland, 2024). ESG data reporting is the process of providing structured information about an organization's environmental, social, and governance performance (Chen et al., 2023), which can be used to assess sustainability efforts and organizational accountability. The credibility and accuracy of data used to report on ESG indices are key to quality reporting. Organizations with improved biostatistical skills have a greater ability to analyze large amounts of sustainability data (Muthuswamy & Kurbanov, 2026), use common analytical approaches, and create accurate performance measures. This analytical approach helps minimize inconsistencies and enhances the transparency of ESG disclosures, elevating the quality of reporting. Thus, the higher the organizational biostatistical analysis skills, the more detailed, precise, and reliable the ESG reports will be leading to better performance.

Hypothesis 1. Higher level of biostatistical analysis enhances ESG data reporting.

2.2 Effect of ESG Data Reporting on Stakeholder Trust

The data reporting on ESG helps stakeholders get an accurate picture of an organizational environmental responsibility, social performance, and governance practices (Wang, 2024). Good ESG disclosure helps to mitigate information asymmetry (Boulton, 2024; Sugianto et al., 2022) by providing transparency and credible evidence on the sustainability work and ethical practices of the organization. Stakeholder trust is an indicator of stakeholders' confidence in the organization (Gulati & Wohlgezogen, 2023), which works in their interests, fulfilling its commitments, and organization is being carried out responsibly. Trust is built when stakeholders get information from the organization as accurate, transparent and credible (Panda & Satapathy, 2024). Stakeholders can measure and assess the performance of organizations objectively by means of comprehensive ESG reporting (Ganc et al., 2026), which shows accountability because it highlights the sustainability outcomes. The higher the transparency, the less uncertainty exists about the intentions of the company, and this builds trust among investor, customer, employee, regulator and other stakeholder groups. Therefore, companies that continue to deliver reliable and transparent ESG data reports are likely to build trust with stakeholders by delivering greater transparency and accountability.

Hypothesis 2. Higher level of ESG data reporting enhances stakeholder trust.

2.3 Effect of Stakeholder Trust on Corporate Reputation

Stakeholder trust has relationship with corporate image of the organization (Kurniawan & Indra, 2026; Matuleviciene & Stravinskiene, 2016). Positive interactions, good communication and responsible behavior build trust (Salman & Ishak, 2023). The overall assessment of an organization regarding its reputation derived from the collective assessment of its conduct, credibility and future performance made by the stakeholders. Successful brands have a good corporate reputation, and the stakeholders have a positive impression of the dependability on company, integrity, and value generation.

Stakeholders with trust in an organization lead to more positive outcomes from the activities of the organization (Aziz et al., 2026), support the strategic decisions that the organization makes (Ford et al., 2020), and share positive opinions about the organization with others. The positive perception helps to build a strong reputation for the organization and cultivates a favorable image among various stakeholders (Chen et al., 2021). Therefore, greater stakeholder trust leads to improved corporate reputation by building trust, credibility and continued positive perceptions of corporate performance.

Hypothesis 3. Higher level of stakeholder trust enhances corporate reputation.

2.4 Effect of Stakeholder Trust and Corporate Reputation on Corporate Legitimacy

Stakeholder trust is one of the important elements of corporate legitimacy (Turner et al., 2016). It emerges when organizations are consistently transparent, accountable and behave ethically towards their stakeholders (Efunniyi et al., 2024). Corporate legitimacy is the degree to which the activities of an organization are accepted as "appropriate and desirable," and in accordance with "prevailing" social norms, values, and expectations. It is believed that organizations seen as legitimate have more acceptance, support from stakeholders and sustainability (Ching & Gerab, 2017). Trust is an important pillar of legitimacy as people would be more inclined to support an organization that they feel is reliable and responsible (Chakraborty & Kumar, 2026; Yoganathan et al., 2026). The more stakeholder confidence grows, the more they acknowledge an organization to accepted norms and expectations. Thus, the companies that build up greater trust of their stakeholders are more likely to enhance their legitimacy and gain long-term acceptance of their stakeholders.

Hypothesis 4. Higher level of stakeholder trust enhances corporate legitimacy.

Corporate reputation is the amalgamation of stakeholders' perceptions and experiences over time of an organizational credibility, reliability and performance (Ningtyas et al., 2026). A positive reputation indicates that the organization consistently acts responsibly, meets stakeholder expectations and provides value in the long term (Neville et al., 2005). The legitimacy of the corporation is not only a positive assessment, but also a reflection of the general acceptance of an organizational right to exist, act and make decisions within society. A good reputation facilitates stakeholders' and community support (Romenti, 2010), as they are more likely to trust, believe in and value the organization that has a positive reputation. Furthermore, having a positive reputation boosts the credibility of the organizations (Mahon & Wartick, 2012) and helps to alleviate doubts about business practices, thus improving social acceptance. Thus, organizations with better corporate reputations are projected to have greater corporate legitimacy through strengthening stakeholder trust and organizational responsibility.

Hypothesis 5. Higher level of corporate reputation enhances corporate legitimacy.

Corporate reputation has the potential to transfer the positive effect of stakeholder trust on corporate legitimacy. These positive perceptions slowly build into a good corporate reputation (Helm, 2007), a result of the organizational promotion towards credibility and position within the eyes of stakeholders. A positive reputation, in turn, improves the legitimacy of the company (Lim & Zhang, 2025), which raises its acceptance in the society and validates in stakeholders' minds that the company acts according to the accepted norms and the expectations of its stakeholders. The trust of the stakeholders may directly affect the legitimacy of the company (Turner et al., 2016), but with the mediation of corporate reputation, its influence is expected to bring about a greater impact. Reputation is an explicit organizational asset that consistent on reliability and responsible conduct to a larger community, which helps establish to legitimacy. Thus, it is expected that corporate reputation can act as an important explanatory mechanism by which stakeholder trust helps to build corporate legitimacy.

Hypothesis 6. Corporate reputation serves as the underlying mechanism linking stakeholder trust to corporate legitimacy.

2.5 Conceptual Framework of the Study

The study is based on the legitimacy theory that organizations will make their actions seem legitimate to the society and its values and expectations in order to continue to be accepted and supported (Burlea & Popa, 2013). This theory suggests that in order to build the legitimacy of organizations they need to be transparent, accountable and act responsibly (Hamm et al., 2022), which can be achieved by providing credible disclosures. Biostatistical analysis is proposed as an analytical capability to enhance the accuracy and reliability of ESG data reporting. Good ESG reporting adds to the confidence of the trust placed in an organization and helps to promote reliable information between the organization and its stakeholders. Building trust among stakeholders results in a better corporate reputation (Swift, 2001), as positive stakeholder perceptions of the integrity and performance of the organization strengthen the corporate reputation. Thus, a positive corporate reputation follows and it helps to build corporate legitimacy by conveying responsible and socially appropriate corporate behavior. Hence, Legitimacy Theory offers a logical justification for the sequential relationships that were posited in this study and for a conceptual framework that is integrated. Framework of the study based on Legitimacy Theory along with hypotheses are reported in Figure 1.

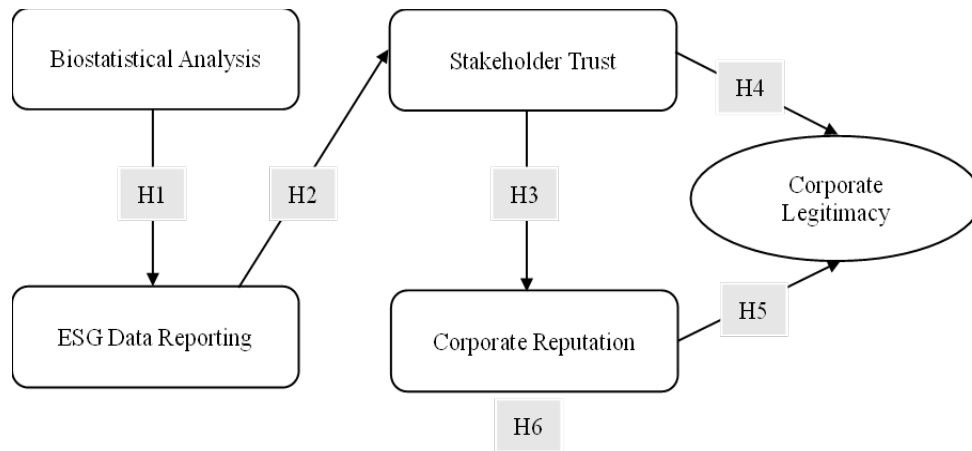


Figure 1: Conceptual Framework of the Study

3. Methodology

A quantitative research design was used to test and investigate the proposed relationships between the variables of biostatistical analysis, ESG data reporting, stakeholder trust, corporate reputation, and corporate legitimacy. A cross-sectional survey approach was used, which was suitable for investigating theoretically derived relationships between latent constructs from a large sample of respondents. In addition, the cross-sectional design is a design that is widely used in behavioral and management research and is used to test a conceptual model efficiently in one period of collecting data. The complete research of this study is presented in Figure 2.

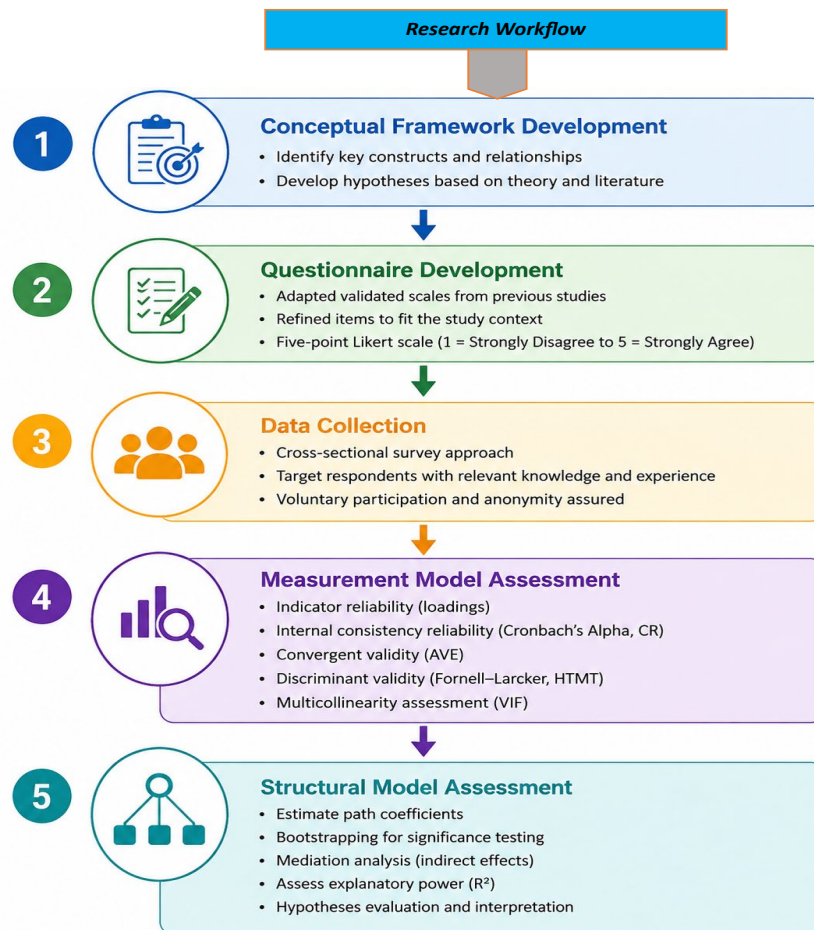


Figure 2: Research Workflow

The research instrument was measurement scales which were previously validated and adapted from the previous studies in order to have content validity and construct reliability. Each measurement item was slightly adapted to reflect the context of ESG reporting. The responses were made on a 5-point Likert scale (1 = Strongly Disagree, 5 = Strongly Agree), enabling the respondents to give a consistent response for each of the constructs. Scale items of biostatistical analysis was adapted from [Li et al. \(2024\)](#) and the scale items of ESG data reporting was adapted from [Al-Din \(2024\)](#). Furthermore, scale items of stakeholder trust and corporate reputation was adapted from [Pirson and Malhotra \(2011\)](#) and [Özkan et al. \(2020\)](#), respectively. Finally, scale items of corporate legitimacy was adapted from [Brønn and Vidaver-Cohen \(2009\)](#). All the scale items are reported in appendix.

Participants were people who had sufficient knowledge about the sustainability reporting and practices related to ESG. The respondents comprised managers and professionals working in listed companies who were directly involved in ESG reporting, sustainability management, corporate governance, compliance, finance, internal auditing, and organizational data analytics. These professionals were selected because their roles require direct involvement in collecting, analyzing, validating, or reporting ESG information, making them well qualified to evaluate the study constructs. The questionnaire was pre-tested for clarity of wording and appropriateness of sequencing and for the understanding of the respondents prior to the main survey, thereby reducing the measurement errors and confusion. Out of all distributed questionnaires, 203 questionnaires were received. This study examined Common Method Bias (CMB) through Variance Inflation Factors (VIF). It can be observed by considering Figure 3, highlighting that all the values are less than 3.3 which confirmed that CMB is not an issue ([Kock, 2015](#)).

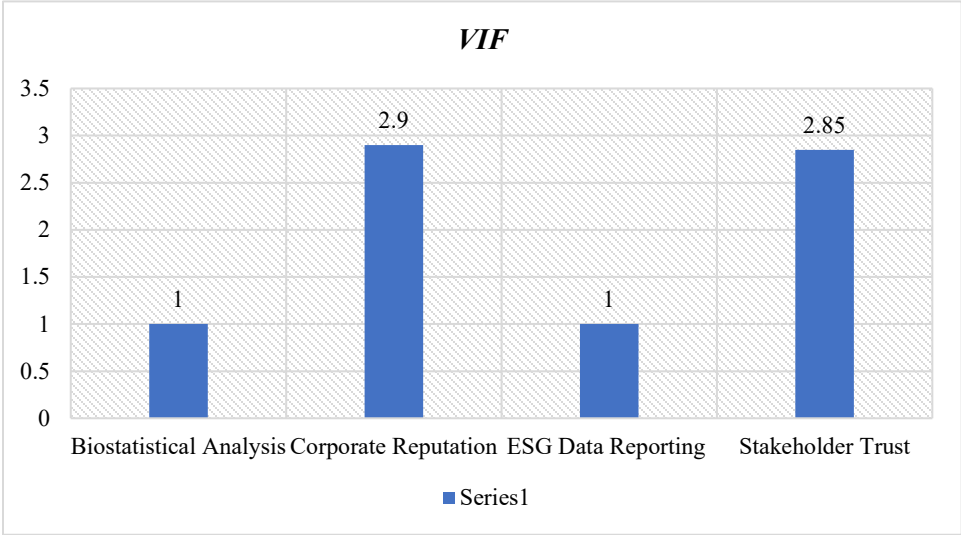


Figure 3: Variance Inflation Factor (VIF)

Structural Equation Modeling (SEM) was used to evaluate the proposed conceptual framework. Therefore, SEM as the analysis method was used since it was suitable for a study that examines complex structural relationships between multiple latent variables and mediation effects simultaneously. There were two steps in the analytical procedure. The first step was to test the indicators' reliability, internal consistency reliability, convergent validity, discriminant validity, and multicollinearity between the indicators of the measurement model. Second, the structural model was evaluated using bootstrapping to determine path coefficients, the significance of the hypotheses, the explanatory power (R^2), and the mediational effect of corporate reputation.

4. Data Analysis

The results of the measurement model assessment are shown in Table 1, where the indicator loadings, Cronbach's alpha, composite reliability (CR) and average variance extracted (AVE) are presented. The indicator loadings were satisfactory with all exceeding the recommended value of 0.70, ranging from 0.707 to 0.924 ([Ramayah et al., 2018](#)). Similarly, Cronbach's alpha values ranged from 0.873 to 0.935 and composite reliability values ranged from 0.913 to 0.949, which were all higher than the recommended level of 0.70, indicating good internal consistency reliability. Moreover, the AVE scores of all constructs were fairly high, from 0.608 to 0.822, higher than the threshold value of 0.50, indicating good convergent validity ([Tanveer & Latif, 2025](#)). In general, this result indicates the high construct reliability and the high convergent validity of the measurement items in the measurement model, meaning that it is reliable to measure the items of the measurement model that are designed to measure the latent constructs they are intended to measure.

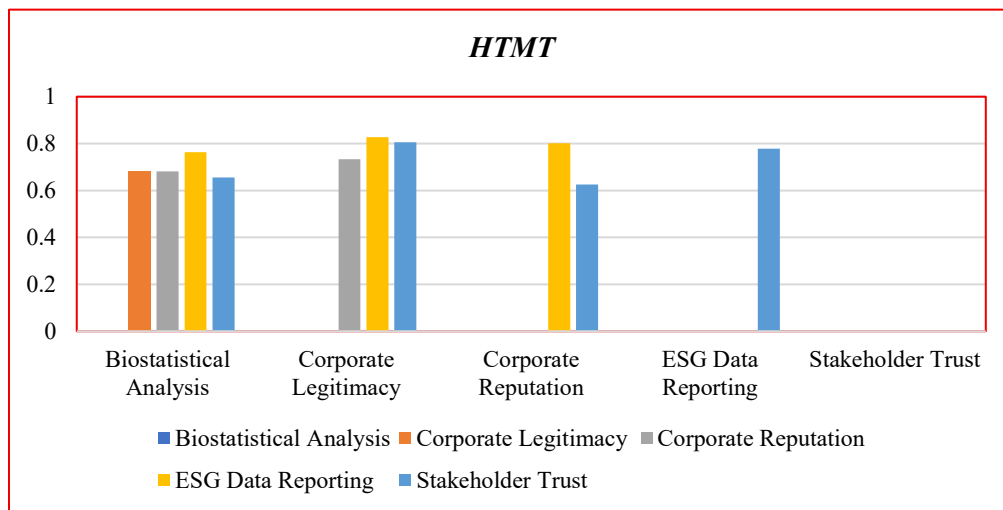
Table 1: Convergent Validity

Construct	Indicators (Loading)
Biostatistical Analysis Cronbach's Alpha = 0.928 Composite Reliability = 0.949 AVE = 0.822	BioA1 (.880), BioA2 (.916), BioA3 (.916), BioA4 (.914)
Corporate Legitimacy Cronbach's Alpha = 0.89 Composite Reliability = 0.925 AVE = 0.755	CL1 (.891), CL2 (.924), CL3 (.906), CL4 (.743)
Corporate Reputation Cronbach's Alpha = 0.898 Composite Reliability = 0.929 AVE = 0.767	CR1 (.881), CR2 (.877), CR3 (.902), CR4 (.841)
ESG Data Reporting Cronbach's Alpha = 0.935 Composite Reliability = 0.944 AVE = 0.608	ESGDR1 (.707), ESGDR2 (.710), ESGDR3 (.714), ESGDR4 (.802), ESGDR5 (.828), ESGDR6 (.776), ESGDR7 (.816), ESGDR8 (.801), ESGDR9 (.828), ESGDR10 (.777), ESGDR11 (.802)
Stakeholder Trust Cronbach's Alpha = 0.873 Composite Reliability = 0.913 AVE = 0.724	ST1 (.837), ST2 (.846), ST3 (.848), ST4 (.873)

The HTMT was used to determine the discriminant validity results (Yusoff et al., 2020), which are presented in Table 2. The values ranged from 0.625 to 0.827, and none of them exceeded the conservative value of 0.85, which reflects good discriminant validity between the constructs of the studied variables. These results confirm that each of the constructs measured a different conceptual domain and that they are empirically different. Thus, the results validate that there was a clear distinction among the aspects of biostatistical analysis, reporting of ESG data, stakeholder trust, corporate reputation and corporate legitimacy. Additionally, the full HTMT matrix is shown in Figure 4, where all inter-construct correlations stay inside the limit agreed to for the discriminant validity of the measurement model.

Table 2: Discriminant Validity

	Biostatistical Analysis	Corporate Legitimacy	Corporate Reputation	ESG Data Reporting	Stakeholder Trust
Biostatistical Analysis					
Corporate Legitimacy	0.68				
Corporate Reputation	0.682	0.734			
ESG Data Reporting	0.764	0.827	0.801		
Stakeholder Trust	0.655	0.805	0.625	0.778	

**Figure 4:** Heterotrait-Monotrait Ratio of Correlations (HTMT)

The structural model was assessed following the adequacy of the measurement model with the bootstrapping procedure (Hair Jr et al., 2017). As indicated in Table 3, the results show that all the hypothesized direct relationships are positive and statistically significant. In particular, the biostatistical analysis has a positive effect on the ESG data reporting,

with a coefficient of $\beta = 0.711$, $t = 19.809$ and $p < 0.001$, supporting H1. ESG data reporting significantly enhances stakeholder trust ($\beta = 0.795$, $t = 34.306$, $p < 0.001$), thereby supporting H2. Similarly, stakeholder trust has positive impact on corporate reputation ($\beta = 0.820$, $t = 41.342$, $p < 0.001$) and therefore H3 is also supported. Additionally, the results show that the trust of stakeholders significantly impacts on corporate legitimacy ($\beta = 0.302$, $t = 4.518$, $p < 0.001$) supporting the hypothesis H4, while corporate reputation significantly influences on corporate legitimacy ($\beta = 0.589$, $t = 9.840$, $p < 0.001$) supporting hypothesis H5. The mediation analysis also shows that the indirect effect of stakeholder trust on corporate legitimacy through corporate reputation is significant with the value of $\beta = 0.483$, $t = 9.744$, and $p < 0.001$, which supports H6. The mediation model is shown in Figure 5 where corporate reputation is seen as an important mechanism that mediate the relationship between stakeholder trust and corporate legitimacy. These findings together offer solid empirical basis for the conceptual framework proposed.

Table 3: Hypotheses Results (Direct Effect and Indirect Effect)

	Beta	Standard Deviation	T Statistics (O/STDEV)	P Values	Decision
Biostatistical Analysis -> ESG Data Reporting	0.711	0.036	19.809	$p < 0.001$	Supported
Corporate Reputation -> Corporate Legitimacy	0.589	0.06	9.84	$p < 0.001$	Supported
ESG Data Reporting -> Stakeholder Trust	0.795	0.023	34.306	$p < 0.001$	Supported
Stakeholder Trust -> Corporate Legitimacy	0.302	0.067	4.518	$p < 0.001$	Supported
Stakeholder Trust -> Corporate Reputation	0.82	0.02	41.342	$p < 0.001$	Supported
Stakeholder Trust -> Corporate Reputation -> Corporate Legitimacy	0.483	0.05	9.744	$p < 0.001$	(Mediation) Supported

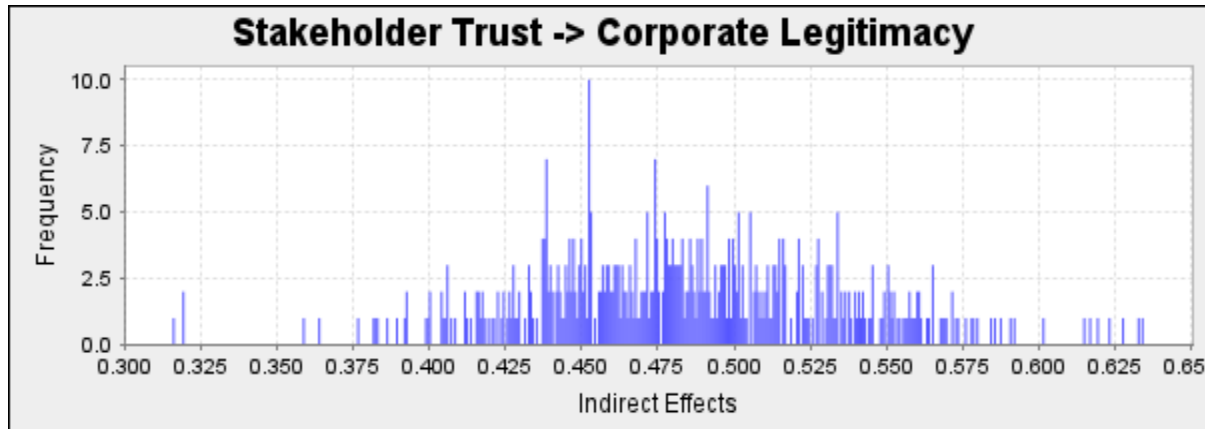


Figure 5: Stakeholder Trust -> Corporate Reputation -> Corporate Legitimacy

The explanatory value of the structural model was estimated by the coefficient of determination (R^2). The endogenous constructs show good R^2 values as presented in Figure 6 is above 0.6 and, therefore, the proposed model accounts for a significant portion of the variance in the endogenous constructs. The results indicate that the conceptual structure has some predictive capacity and offers significant explanatory value for the relationships studied in this research. As all the variables are expected to bring 73.1% variance in corporate legitimacy which is strong.

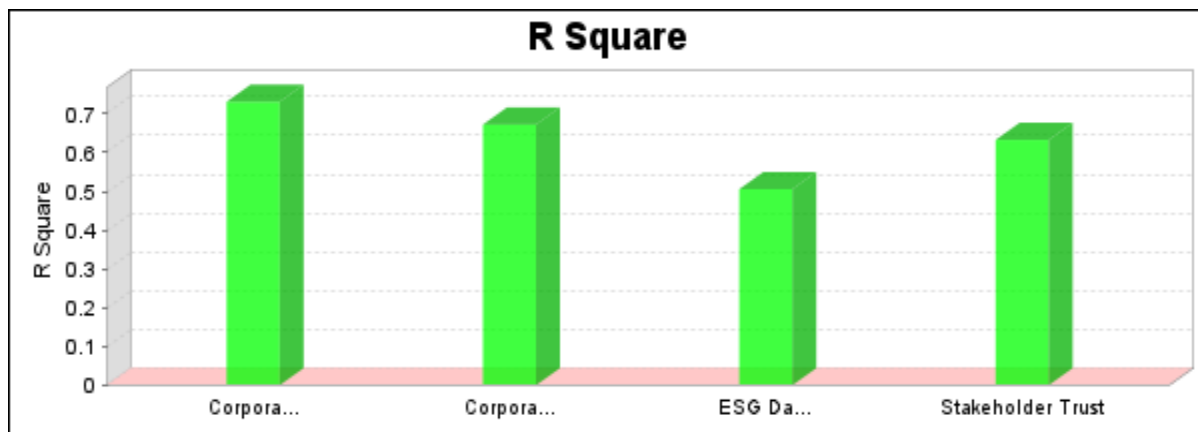


Figure 6: R-Squared (R^2)

5. Discussion and Conclusion

The current research investigated the sequential associations between biostatistical analysis, ESG data reporting, trust, corporate reputation, and corporate legitimacy in the context of a single framework based on Legitimacy Theory. The empirical results support all the hypotheses and the results show that the analytical capability leads to organizational legitimacy via a series of intermediate mechanisms. In general, the results support the notion that organizations can build their legitimacy not only by simply publishing ESG data, but by doing this in a way that is backed by robust analytical processes that instill greater confidence and reputation.

The results confirmed Hypothesis 1 and suggests that biostatistical analysis has a positive and significant impact on reporting of ESG data. This finding implies that companies with more analytical capacity can communicate more accurate, consistent and reliable sustainability information. Through biostatistical analysis, organizations can verify a complex set of data, reduce inconsistencies in reporting and enhance the quality of ESG reporting overall. This means that companies with a high level of analytical capacity can produce clear sustainability reports that satisfy the wishes of stakeholders. This is in line with the previous studies which have highlighted that robust analytical techniques can enhance the quality, reliability and credibility of sustainability reporting (Hussien et al., 2025; Sebrina et al., 2023; Wanner & Janiesch, 2019) in bridging the information gap and enable evidence-based decision making. The result further contributes to the existing literature by providing proof that biostatistical capability is a significant organizational asset to increase the trustworthiness of ESG reporting.

The findings also lend good support to Hypothesis 2, which states that stakeholder trust is strengthened with the reporting of ESG data. A good level of ESG reporting is creating transparency (Zenkina, 2023) by giving stakeholders credible information on ESG performance (Katisart et al., 2025). Stakeholders gain confidence that the organization is ethically sound and in line with its sustainability initiatives if the disclosures they receive are reliable. The results echo previous studies which indicated that transparency in ESG disclosure lowers uncertainty, boosts accountability and stakeholder confidence (Katisart et al., 2025; Zenkina, 2023). The present study also finds that the extent to which the trust is placed by the stakeholders is not just the presence of ESG disclosures; it is also the perceived credibility and quality of disclosure. As a result, those companies that invest in dependable ESG reporting will be more likely to build long-lasting relationships with stakeholders.

The outcomes of the findings also validate Hypothesis 3 which suggests that stakeholder trust has a significant impact on corporate reputation. Trust is a precious intangible quality that influences the overall impression of organizational performance, integrity and competence (Guinot et al., 2013). A trustworthy perception by stakeholder would lead to positive communication of opinion, assistance to organizational initiatives, and positive long-term relationships, thereby enhancing corporate reputation. The results of this study are consistent with the previous studies which have established that stakeholder trust is one of the basic antecedents of corporate reputation as a confirmation of reliability and ethical actions of the organization (Kim, 2019; Matuleviciene & Stravinskiene, 2016; Swift, 2001). The present results build upon previous research which analyzed trust and reputation separately, as they offer further evidence that stakeholder trust is a key factor in the development of positive reputational capital of organizations.

The empirical results also support Hypothesis 4 which shows that stakeholder trust has a positive effect on the company's legitimacy. High levels of stakeholder trust are likely to lead to social acceptance as they are seen as responsible, transparent and acting in line with expectations. Trust serves as a base for the legitimacy of the organizations (Hough et al., 2013). This fact validates the core views of Legitimacy Theory (Burlea & Popa, 2013; Hamm et al., 2022) that holds that organizations gain legitimacy when their behavior is seen as legitimate and socially acceptable. Therefore, stakeholder confidence contributes to organizational acceptance and further entitles long-term legitimacy. Therefore, the present study provides empirical evidence that trust by the stakeholders directly influences legitimacy in the context of ESG reporting.

The results of supporting Hypothesis 5 show that there is a significant positive influence between corporate reputation to corporate legitimacy. The corporate reputation is the sum of the evaluations (Mahon & Wartick, 2012; Neville et al., 2005), made by the stakeholders, of an organization's credibility, ethics and sustainable performance. Therefore, if an organization has a good reputation, its reputation signals consistent organizational responsibility, which makes it more likely to receive approval from society and the support of its stakeholders. This is in line with previous studies that regard corporate reputation as a significant factor in shaping the legitimacy of the organization (King & Whetten, 2008; Lim & Zhang, 2025) because it boosts public trust and decreases skepticism about the organization's actions. The results also support the view that legitimacy is not only gained by meeting the expectations of stakeholders but is reinforced over time through building a positive organization reputation.

Finally, the results validate Hypothesis 6, which proposes that corporate reputation mediates the relationship between stakeholder trust and corporate legitimacy. While stakeholder trust has a direct effect on legitimacy, it has a significantly greater effect if it is manifested in a positive corporate image. The finding implies trust alone is not enough to achieve

maximum organizational legitimacy if trust does not lead to a general reputation that is recognized by multiple stakeholder groups. The results of the present study therefore indicate empirical evidence that the mechanism that links stakeholder trust with corporate legitimacy is through the process of corporate reputation, which in turn supports the sequence process proposed by the conceptual framework. These findings confirm the theoretical model and evidence of the interdependencies of analytical ability, credible ESG reporting, stakeholder trust, and corporate reputation to foster the creation of corporate legitimacy.

Finally, the results of this study show that biostatistical analysis is a crucial component in improving the quality of ESG data reporting, which in turn boosts stakeholder trust, corporate reputation and ultimately corporate legitimacy. The empirical results confirm the importance of organizations having reliable analytical skills, which will lead to more credible sustainability disclosures and allow organizations to improve their social acceptance and establish better relationships with stakeholders. Additionally, it finds that corporate reputation is an important mediating factor between stakeholder trust and corporate legitimacy. This study brings together these constructs in a single sequential model that rests on Legitimacy Theory to offer a complete explanation of the role analytical capability plays in the success of an organization in achieving sustainability. The results point to the fact that reliable ESG reporting, backed by robust biostatistical analyses, is a strategic route for companies to enhance their legitimacy and stakeholder trust in the long term.

5.1 Managerial Implications

The findings have a number of implications for managers responsible for sustainability reporting and corporate governance. First, organizations must further build its capability in biostatistics, including investment in advanced analytical tools, training of employees, etc., and promote the accuracy and credibility of ESG data reporting through strong analytical practices. Second, there is the need for sustainability managers to establish consistent data validation and verification processes before publishing ESG reports to improve the trust of stakeholders in the data and eliminate concerns about what is being disclosed. Third, senior executives need to embrace ESG reporting as a trust-building tool and not just a compliance one, with sustainable reporting data being evidence-based and transparent. In addition, the communication strategies of the companies ought to constantly highlight the trustworthy accomplishments of ESG, to confirm the company's reputation, and therefore, its legitimacy. Finally, analytical knowledge needs to be built into sustainable governance mechanisms, consequently that organizations can turn sustainable data into better relationships with stakeholders, a better reputation and lasting legitimacy.

6. Limitations of the Study

This study considered biostatistical analysis as one organizational capacity and not as a set of specific analytical methods, such as predictive analytics, machine learning, Bayesian analysis and longitudinal statistical modelling. The quality of ESG reporting could vary depending on the analytical approaches. The comparative impacts of the individual analytical tools should be explored in future studies to establish which of these tools is the most effective in strengthening and improving the credibility and usefulness of ESG disclosures. Second, the proposed framework can only be seen as an explanation of corporate legitimacy on the bases of ESG data reporting, stakeholder trust, and corporate reputation, and other organizational mechanisms that can impact legitimacy are not included. The process towards legitimacy can be further strengthened by factors like ESG assurance, the quality of sustainability governance, board oversight or transparency of the organization. Third, this study assumes that "stakeholder trust" is a single construct, though it could be differentiated into three categories of stakeholder trust: low, medium, and high. There are different expectations and information needs among investors, customers, employees, regulators, and suppliers on sustainability disclosures. Further studies could engage in multi-group analysis or stakeholder-specific models to explore whether the proposed relationships differ between the stakeholder groups to have more sophisticated insights into organizational legitimacy. Lastly, the present study is limited to examining the mediating effect of corporate reputation, without considering the circumstances in which the mediation might be strengthened or weakened. The level of ESG reporting maturity, digitization competency, sustainability culture, and environmental sensitivity of the industry could be important organizational characteristics that may affect the effectiveness of reputation in its role of turning stakeholder trust into corporate legitimacy. This is an area for further research: the contextual factors which may be considered as moderators to determine the context in which the legitimacy benefits of credible ESG reporting are maximized.

7. Funding

This work was supported by the Deanship of Scientific Research, Vice Presidency for Graduate Studies and Scientific Research, King Faisal University, Saudi Arabia [Grant Number KFU264398].

8. References

- Al-Din, W. F. (2024). The role of the ESG sustainability indicators in enhancing the quality of reporting: An exploratory study of a sample of university professors specializing in accounting in the Holy Najaf Governorate. *Entrepreneurship Journal for Finance and Business*, 5(3), 61-70.
- Aziz, T. A. R., Bigodza, E. K., Ahenkan, A., & Mensah, J. K. (2026). Building stakeholder trust in regulatory governance: Evidence from Ghana's public utilities regulatory commission. *Utilities Policy*, 98, 102082.
- Boulton, T. J. (2024). Mandatory ESG disclosure, information asymmetry, and litigation risk: Evidence from initial public offerings. *European Financial Management*, 30(5), 2790-2839.
- Brønn, P. S., & Vidaver-Cohen, D. (2009). Corporate motives for social initiative: Legitimacy, sustainability, or the bottom line? *Journal of Business Ethics*, 87(Suppl 1), 91-109.
- Burlea, A. S., & Popa, I. (2013). Legitimacy theory. *Encyclopedia of corporate social responsibility*, 21(6), 1579-1584.
- Camilleri, M. A. (2026). Environmental, social and governance (ESG) factors for sustainable tourism development: The way forward toward destination resilience and growth. *Business strategy and the environment*, 35(3), 4057-4082.
- Cepêda, C., Monteiro, A. P., & Aibar-Guzmán, C. (2026). When Sustainability Reporting Becomes a Strategy: The Impact of Financial Performance and Institutional Pressures From EU Sustainability Reporting Regulations on ESG Decoupling. *Corporate Social Responsibility and Environmental Management*.
- Chakraborty, I., & Kumar, N. (2026). Trust as institutional infrastructure: Balancing isomorphism and legitimacy in the governance of GenAI for healthcare. *Technological Forecasting and Social Change*, 226, 124615.
- Chen, C.-C., Khan, A., Hongsuchon, T., Ruangkanjanases, A., Chen, Y.-T., Sivarak, O., & Chen, S.-C. (2021). The role of corporate social responsibility and corporate image in times of crisis: The mediating role of customer trust. *International Journal of Environmental Research and Public Health*, 18(16), 8275.
- Chen, S., Song, Y., & Gao, P. (2023). Environmental, social, and governance (ESG) performance and financial outcomes: Analyzing the impact of ESG on financial performance. *Journal of environmental management*, 345, 118829.
- Ching, H. Y., & Gerab, F. (2017). Sustainability reports in Brazil through the lens of signaling, legitimacy and stakeholder theories. *Social Responsibility Journal*, 13(1), 95-110.
- Darnall, N., Ji, H., Iwata, K., & Arimura, T. H. (2022). Do ESG reporting guidelines and verifications enhance firms' information disclosure? *Corporate Social Responsibility and Environmental Management*, 29(5), 1214-1230.
- Diwan, H., & Amarayil Sreeraman, B. (2024). From financial reporting to ESG reporting: a bibliometric analysis of the evolution in corporate sustainability disclosures: H. Diwan, BA Sreeraman. *Environment, development and sustainability*, 26(6), 13769-13805.
- Efunniyi, C. P., Abbulimen, A. O., Obiki-Osafiele, A. N., Osundare, O. S., Agu, E. E., & Adeniran, I. A. (2024). Strengthening corporate governance and financial compliance: Enhancing accountability and transparency. *Finance & Accounting Research Journal*, 6(8), 1597-1616.
- Fagbemi, B. T., Saah, B. P., Nduka, A. I., & Aloke, E. M. (2025). The evolution of ESG and sustainability reporting: A review of standards, challenges, and impacts on corporate transparency. *Journal of Economics, Business, and Commerce*, 2(2), 297-305.
- Ford, J. K., Riley, S. J., Lauricella, T. K., & Van Fossen, J. A. (2020). Factors affecting trust among natural resources stakeholders, partners, and strategic alliance members: a meta-analytic investigation. *Frontiers in Communication*, 5, 9.
- Ganc, M., Rouibah, K., Wasilewski, M., & Ratajczak, M. (2026). The Role of Trust in ESG Implementation–Impact on Corporate Sustainability and Stakeholder Engagement. In *Trust and ESG Strategies* (pp. 14-30). Routledge.
- Gazzola, P., Amelio, S., & Vota, V. (2026). When Does ESG Create Value? A Literature Review on Benefits, Credibility, and Enabling Factors. *Journal of Risk and Financial Management*, 19(5), 360.
- Guinot, J., Chiva, R., & Mallén, F. (2013). Organizational trust and performance: Is organizational learning capability a missing link? *Journal of Management & Organization*, 19(5), 559-582.

- Gulati, R., & Wohlgezogen, F. (2023). Can purpose foster stakeholder trust in corporations? *Strategy Science*, 8(2), 270-287.
- Hair Jr, J. F., Matthews, L. M., Matthews, R. L., & Sarstedt, M. (2017). PLS-SEM or CB-SEM: updated guidelines on which method to use. *International Journal of multivariate data analysis*, 1(2), 107-123.
- Hamm, J. A., Wolfe, S. E., Cavanagh, C., & Lee, S. (2022). (Re) Organizing legitimacy theory. *Legal and Criminological Psychology*, 27(2), 129-146.
- Helm, S. (2007). One reputation or many? Comparing stakeholders' perceptions of corporate reputation. *Corporate communications: an international journal*, 12(3), 238-254.
- Hough, M., Jackson, J., & Bradford, B. (2013). Legitimacy, trust and compliance: An empirical test of procedural justice theory using the European Social Survey.
- Hussien, L. F., Alshaketheep, K., Al-Ahmed, H., Shajrawi, A., Alghizzawi, M., Zraqat, O., & Deeb, A. (2025). The impact of big data analytics on the sustainability reports quality. *Discover Sustainability*, 6(1), 776.
- Katisart, N., Sutthachai, S., & Saenchaiyathon, K. (2025). Can stakeholders evaluate corporate ESG performance through its ESG disclosure? A study of Thai listed firms. *International Journal of Disclosure and Governance*, 22(2), 461-475.
- Kim, S. (2019). The process model of corporate social responsibility (CSR) communication: CSR communication and its relationship with consumers' CSR knowledge, trust, and corporate reputation perception. *Journal of Business Ethics*, 154(4), 1143-1159.
- King, B. G., & Whetten, D. A. (2008). Rethinking the relationship between reputation and legitimacy: A social actor conceptualization. *Corporate Reputation Review*, 11(3), 192-207.
- Kock, N. (2015). Common method bias in PLS-SEM: A full collinearity assessment approach. *International Journal of e-Collaboration (ijec)*, 11(4), 1-10.
- Kurniawan, A., & Indra, R. (2026). Public Trust and Corporate Transparency in Shaping Corporate Reputation Through Corporate Image. *Glosains: Jurnal Sains Global Indonesia*, 7(2), 701-715.
- Li, C., Zhang, Y., Qin, W., Xia, J., Shang, L., & Wang, L. (2024). Assessing attitudes towards biostatistics education among medical students: adaptation and preliminary evaluation of the Chinese version survey of attitudes towards statistics (SATS-36). *BMC medical education*, 24(1), 634.
- Liang, L., Ding, T., Tan, R., & Song, M. (2025). ESG performance evaluation and reporting. In *The ESG systems in Chinese enterprises: Theory and practice* (pp. 213-242). Springer.
- Lim, J. S., & Zhang, J. (2025). Stakeholder engagement and authenticity in corporate social advocacy: Pathways to corporate reputation via perceived legitimacy. *Journal of Public Relations Research*, 37(5), 470-497.
- MacFarland, T. W. (2024). Role of Statistics for Decision-Making in Biostatistics. In *Introduction to Data Science in Biostatistics: Using R, the Tidyverse Ecosystem, and APIs* (pp. 147-173). Springer.
- Mahon, J., & Wartick, S. L. (2012). Corporate social performance profiling: using multiple stakeholder perceptions to assess a corporate reputation. *Journal of Public affairs*, 12(1), 12-28.
- Matuleviciene, M., & Stravinskiene, J. (2016). How to develop key stakeholders trust in terms of corporate reputation. *Inžinerinė ekonomika*, 27(4), 472-478.
- Muthuswamy, V. V., & Kurbanov, D. (2026). Biostatistical Analytics and Sustainable Business Performance: The Sequential Mediating Effects of Epidemiological Surveillance and Crisis Preparedness under Digital Transformation Capability. *Letters in biomathematics*, 13(3).
- Neville, B. A., Bell, S. J., & Mengüç, B. (2005). Corporate reputation, stakeholders and the social performance-financial performance relationship. *European Journal of Marketing*, 39(9-10), 1184-1198.
- Ningtyas, H. I. R., Mualim, W., & Nusron, A. (2026). Artificial Intelligence in The Application of ESG to Improve Company Reputation: The Moderating Role of Financial Performance. *Journal of Accounting Science*, 10(1), 60-80.
- Nuraini, L., & Amrulloh, A. (2024). Auditors and sustainability reporting: Ensuring accuracy and transparency in ESG disclosure. *Researcher Academy Innovation Data Analysis*, 1(2), 112-124.

- Özkan, P., Süer, S., Keser, İ. K., & Kocakoç, İ. D. (2020). The effect of service quality and customer satisfaction on customer loyalty: The mediation of perceived value of services, corporate image, and corporate reputation. *International Journal of Bank Marketing*, 38(2), 384-405.
- Panda, S. K., & Satapathy, S. C. (2024). Drug traceability and transparency in medical supply chain using blockchain for easing the process and creating trust between stakeholders and consumers. *Personal and Ubiquitous Computing*, 28(1), 75-91.
- Pirson, M., & Malhotra, D. (2011). Foundations of organizational trust: What matters to different stakeholders? *Organization science*, 22(4), 1087-1104.
- Raghuvanshi, S., Milan, R., Verma, A., Behera, S. S., & Choudhary, M. (2026). ESG Reporting, Stakeholder Governance, and Organizational Performance: A Theoretical Accounting Perspective. *Journal of Theoretical Accounting Research*, 22, 68.
- Rahmenführer, J., De Bin, R., Benner, A., Ambroggi, F., Lusa, L., Boulesteix, A.-L., Migliavacca, E., Binder, H., Michiels, S., & Sauerbrei, W. (2023). Statistical analysis of high-dimensional biomedical data: a gentle introduction to analytical goals, common approaches and challenges. *BMC medicine*, 21(1), 182.
- Ramayah, T., Cheah, J., Chuah, F., Ting, H., & Memon, M. A. (2018). Partial least squares structural equation modeling (PLS-SEM) using smartPLS 3.0. *An updated guide and practical guide to statistical analysis*, 1(1), 1-72.
- Romenti, S. (2010). Reputation and stakeholder engagement: an Italian case study. *Journal of Communication Management*, 14(4), 306-318.
- Salman, N. A., & Ishak, N. (2023). Enhancing corporate social responsibility (CSR) communication and stakeholder engagement: Strategies for building trust and fostering social impact. *The Asian Journal of Professional & Business Studies*, 4(1), 59-67.
- Sebrina, N., Taqwa, S., Afriyenti, M., & Septiari, D. (2023). Analysis of sustainability reporting quality and corporate social responsibility on companies listed on the Indonesia stock exchange. *Cogent Business & Management*, 10(1), 2157975.
- Singh, K., & Arora, A. (2025). ESG reputation and the possibility of energy inefficiency: does stakeholder perception conceal the adverse effects of compromised legitimacy? *Social Responsibility Journal*, 21(10), 2253-2270.
- Sugianto, N. A. P., Riandy, C. N., Zainavy, S. F., & Hartikasari, A. I. (2022). The contribution of Environmental, Social, and Governance (ESG) disclosure to reduce investor asymmetry information. *Proceedings Series on Social Sciences & Humanities*, 7, 56-61.
- Sundarasan, S., Zyznarska-Dworczak, B., & Mahmood, N. A. (2026). Understanding ESG reporting drivers: governance mechanisms, firm attributes, and regulatory roles. *Cogent Business & Management*, 13(1), 2622212.
- Swift, T. (2001). Trust, reputation and corporate accountability to stakeholders. *Business Ethics: A European Review*, 10(1), 16-26.
- Tanveer, A., & Latif, M. (2025). Metaverse-Based Business Models (MBMs) and Shadow AI Usage: The Solution to Knowledge Leakage in Business Industry. *Journal of Metaverse Business Designs*, 6(1), 44-55.
- Turner, R. A., Addison, J., Arias, A., Bergseth, B. J., Marshall, N. A., Morrison, T. H., & Tobin, R. C. (2016). Trust, confidence, and equity affect the legitimacy of natural resource governance. *Ecology and society*, 21(3).
- Usha, A., George, N., Janagi, K., & Verma, P. (2026). Machine learning techniques in biomedical data analysis: A scoping review of biostatistical perspectives. *Clinical Epidemiology and Global Health*, 102362.
- Wang, C. (2024). The relationship between ESG performance and corporate performance-based on stakeholder theory. In *SHS web of conferences* (Vol. 190, pp. 03022). EDP Sciences.
- Wanner, J., & Janiesch, C. (2019). Big data analytics in sustainability reports: an analysis based on the perceived credibility of corporate published information. *Business Research*, 12(1), 143-173.
- Yoganathan, V., Osburg, V.-S., & Janakiraman, N. (2026). Lending legitimacy to corporate digital responsibility: Trust in firm versus government regulation of artificial intelligence services. *Journal of Service Research*, 29(2), 313-333.

Yusoff, A. S. M., Peng, F. S., Razak, F. Z. A., & Mustafa, W. A. (2020). Discriminant validity assessment of religious teacher acceptance: The use of HTMT criterion. In *Journal of Physics: Conference Series* (Vol. 1529, pp. 042045). IOP Publishing.

Zenkina, I. (2023). Ensuring the transparency of ESG reporting based on the development of its standardization. In *E3S Web of Conferences* (Vol. 371, pp. 05077). EDP Sciences.

Appendix: Survey Questionnaire Items (Adapted from Previous Studies)

Variable	Items	Source
Biostatistical Analysis	“Organization has plan to apply all biostatistics tool in business activities. Organization has plan to work hard on biostatistics tool. Organization has plan to attend every biostatistics tool session for business perspective. Organization has plan to study every biostatistics tool to apply in business.	Li et al. (2024)
ESG Data Reporting	ESG reporting helps reduce the cost of new capital. ESG reporting contributes to obtaining ISO quality certifications. ESG reporting contributes to increasing the competitiveness of economic units. ESG reporting contributes to increasing the market share of economic units. ESG reporting contributes to increasing the share price of economic units. ESG reporting contributes to improving the reputation of economic units. ESG reporting helps demonstrate attempts to reduce environmental damage during business. ESG reporting contributes to compliance with environmental standards and regulations. ESG reporting helps drive user investment decision models ESG disclosure helps protect shareholders. ESG disclosure contributes to increasing information user confidence.	Al-Din (2024)
Stakeholder Trust	Organization can successfully adapt to changing demands. Organization is able to achieve set goals. Organization is very competent in its area. Organization generally has high standards.	Pirson and Malhotra (2011)
Corporate Reputation	The organization has a better reputation than its competitors. The organization is constantly improving itself. The organization is improving constantly.	Özkan et al. (2020)
Corporate Legitimacy	The organization is a pioneer in various matters than competitors. Organization improves overall image. Organization serves long-term interests. Organization fulfills stakeholder expectations. Organization is recognized for moral leadership.	Brønn and Vidaver-Cohen (2009)