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The Role of Digital Transformation in Enhancing ESG Disclosure Practices in Saudi Companies

Ahmed Salman Almahuzi[1]*, Mahdi Ahmed Alhamami[2]

[1]Department of Accounting, College of Business Administration, University of Hafr Al Batin, Saudi Arabia. [2]Department of Accounting, College of Business Administration, Najran University, Saudi Arabia. *Email: ASALMAHUZI@uhb.edu.sa

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ABSTRACT

This study examines the role of digital transformation in enhancing environmental, social, and governance (ESG) disclosure practices in Saudi companies and its impact on investor confidence, focusing on improvements in transparency, timeliness, and completeness. The study adopted a quantitative approach, collecting data from professionals in finance, accounting, sustainability, and information technology in Saudi listed companies. The data were analyzed using partial least squares structural equation modeling (PLS-SEM) to test the relationships among digital transformation, ESG disclosure quality, and investor confidence. The results show that digital transformation significantly improves ESG disclosure quality through advanced reporting systems and data-driven technologies. In turn, enhanced disclosure quality strengthens investor confidence by increasing credibility, trust, and investment willingness. The findings also confirm that ESG disclosure quality fully mediates the relationship between digital transformation and investor confidence. This study provides empirical evidence of the mediating role of ESG disclosure quality in linking digital transformation to investor confidence in an emerging market, offering insights for improving ESG reporting through digital technologies.

Keywords: Digital transformation; ESG disclosure; ESG reporting quality; Investor confidence
JEL Classifications: M15, Q56, G34, M41

1. INTRODUCTION

Digital transformation is revolutionizing corporate reporting by making environmental, social, and governance (ESG) disclosure more thorough, improving transparency, and integrating sustainability information more closely with the quality of financial reporting. Empirical research on Chinese listed companies indicates that increased digital transformation, often indicated by the use of digital-related terminology in annual reports, correlates with improved ESG performance and more comprehensive ESG disclosure, in part through greater transparency, green innovation, and dynamic capabilities (Fu and Li, 2023; Nie et al., 2025; Su et al., 2023; Wu and Li, 2023). Other research establishes that digital transformation can either soften or increase the effects of ESG, sustainability, and climate risk reporting on financial performance, emphasizing digital transformation's importance in integrating nonfinancial information into decision-supporting reports (Fu and Li, 2023; Wang and Hou, 2024; Yan et al., 2025).

In the banking sector, digital transformation strengthens the positive relationship between sustainability reporting and financial reporting quality and enhances financial transparency by means of good governance structures enhancing the significance of organizational, technical, and human capabilities in reporting systems (Alassuli et al., 2025; Hamdy et al., 2025). Moreover, the results of research on public-sector settings and greenwashing indicate that lagging or mismanaged digital change may initially decrease the quality of information systems or introduce novel types of symbolic disclosure, indicating that the advantages of corporate reporting are contingent on institutional context and the quality of implementation (Hamdy et al., 2025).

Companies that report more comprehensive ESG information are less likely to encounter idiosyncratic risk or downside tail risk, particularly during IPOs, implying that investors believe that transparently disclosed ESG performance reduces uncertainty and specific risk in a company (Ferri et al., 2023; Reber et al., 2021). ESG and carbon disclosure are associated with a reduction in market uncertainty, cost of capital, and firm value, supporting the conclusion that investors rely on such information to make risk and valuation decisions (Feng and Wu, 2023; Ha et al., 2024; Moussa and Elmarzouky, 2024).

In some industries, however, studies show a negative disclosure premium (high-disclosing firms having slightly lower returns) or even valuation discounts, suggesting that investors may already be pricing in the reduced risk or higher cost of good ESG performance (Chong and Loh, 2023; Khandelwal et al., 2023). Research on institutional investors reveals that they systematically account for ESG criteria—particularly environmental and governance issues—and test country-specific ESG models, which confirms that ESG disclosures have become part of professional investment procedures (Nurhayati et al., 2025; Park and Jang, 2021; Rau and Yu, 2024). On the whole, investors rely on ESG disclosure to evaluate risk, mispricing, and long-term value, and the market tends to reward plausible, uninterrupted sustainability reporting, despite the fact that the impacts on returns may be industry, geography, and the quality of disclosure.

ESG reporting has grown rapidly in emerging markets, albeit not uniformly across nations, industries, and types of firms. In general, disclosure remains voluntary even today for a significant number of companies, and coverage is typically only a limited number of listed companies (Gonzaga et al., 2024). ESG reporting is highly influenced by ownership and governance; in Indonesia and Malaysia, the largest owners have the weakest ESG disclosures and can reinforce tax avoidance strategies through sustainability programs to meet minimum reporting standards and use sustainability programs as tax instruments, yet the monitoring of corporate citizenship activities remains positively associated with firm value (Nurhayati et al., 2025). In Saudi Arabia, larger boards are negatively associated with ESG disclosure, and profitability does not always correlate with better reporting, which means that governance reforms and not performance alone promotes transparency (Basali, 2025).

In emerging markets, enterprises are more focused on social and governance than environmental concerns, and significant country and industry variations and distinguishable changes are evident during and after COVID-19 (Gonzaga et al., 2024). Asia-Pacific evidence indicates that initially, ESG disclosure may negatively affect financial performance unless more internationalized firms can turn ESG disclosure into competitive and funding benefits (Hussain et al., 2024). Emerging economy studies with large sample sizes report a nonlinear relationship of ESG and firm value, as investors occasionally punish an ESG initiative in the short term but reward credible, well-communicated strategies in the long term (Jatmiko et al., 2025). The evidence in banking and frontier markets indicates that increased ESG disclosure may lower risk and be positively priced in stock markets, although data gaps and heterogeneous standards continue to limit comparability and may encourage selective or symbolic reporting (Ha et al., 2024; Shaikh, 2022).

Although corporate reporting increasingly integrates digital transformation, many discrepancies persist with respect to its effectiveness at improving the quality of ESG and financial reporting. Although previous research indicates that digital technologies enhance transparency, sustainability reporting, and risk assessment, such advantages are not always evident in the contexts of various institutions and governance structures. Particularly in emerging markets, ESG disclosure is uneven, frequently voluntary, and subject to governance limitations, leading to problems such as selective reporting and greenwashing. In addition, research presents conflicting evidence regarding the financial impacts of ESG disclosure, as some studies find decreased risk and enhanced valuation in firms, whereas others show neutral or even adverse impacts on returns. This disparity points to a significant knowledge gap on how digital transformation relates to ESG practices in generating reliable, decision-supporting information that can drive better ESG reporting and financial performance.

This research study makes a number of valuable contributions to the academic and practical field, enhancing the knowledge base on the intersection of digital transformation, quality of ESG disclosure, and investor confidence. First, it adds to the theoretical literature by harmonizing these constructs into a single framework, addressing a weakness in previous studies, which have mostly considered them separately. By explicitly analyzing the mediating role of ESG disclosure quality, the study offers a better understanding of how digital transformation affects outcomes related to investors. Second, the study makes an empirical contribution by presenting evidence in a new market environment where ESG reporting practices are not homogenous and institutional factors exert substantial influence in determining disclosure actions. This contextual sensitivity aids in extrapolating available results to other developing economies and improves the generalizability of ESG-related studies. Third, the research has useful practical implications for corporate managers, policymakers, and investors, as it emphasizes the significance of using digital technologies to enhance transparency, improve reporting quality, and increase investor confidence. Finally, the results will inform better decisions and the establishment of more reliable, consistent, and decision-assisting ESG reporting systems.

2. LITERATURE REVIEW

2.1. Digital Transformation

Digital transformation (indicated by the extent of digital-related terms in annual reports) enhances ESG performance and level of disclosure; its effects are mediated by green innovation, social responsibility, and improved operational management (Alhamami and Almahuzi, 2026; Su et al., 2023; Wu and Li, 2023). Digital tools increase the level of information transparency internally, reduce short-termism among managers, and encourage innovation, thereby improving ESG scores from large rating agencies such as Bloomberg and Sustainalytics (Bogdan et al., 2023; Su et al., 2023).

Research also indicates that the positive effects of digital transformation on ESG performance are even greater in the case of the liberalization of financing options, implying that both technology and funding enable more meaningful ESG strategies and reporting as opposed to box-ticking (Fu and Li, 2023). At the executive level, digital transformation coupled with executive pay, such as CEO compensation, is linked to better ESG performance, particularly in large companies, affirming its strategic position in ESG reporting and performance (Nie et al., 2025). On a systems level, there are emerging frameworks of Industry 5.0 and digital disruption that claim that AI, big data, cloud computing, and digital twins can enhance the accuracy, real-time, and forward-looking nature of ESG reporting, expanding the scope of disclosure and supporting double materiality for both firms and investors (Lulaj and Brajković, 2025; Yadav et al., 2024).

Digital technologies, including AI, blockchain, big data, IoT, and XBRL, are transforming financial reporting and digital reporting systems through increased transparency, security, and real-time information as well as creating new privacy and governance concerns. Recent reviews and empirical research indicate that blockchain-immutable, append-only, consensus-validated ledgers can radically enhance the integrity and auditability of accounting books, enabling real-time and triple-entry accounting and providing high-quality input data to AI-enabled audit and analytics (Han et al., 2023; Huang, 2025; Kayikci and Khoshgoftaar, 2024; Shaban and Omoush, 2025). Combining blockchain, IoT, and XBRL in one accounting information system is believed to produce more transparent, standardized, and real-time digital financial reports, but the literature notes that full integration is technically challenging and seldom achieved (Liu et al., 2024). Prototype blockchain financial statements and intelligent financial management systems using blockchain smart contracts and IoT sensors produce automated transaction-to-statement reporting, tamper-evident records, and continuous monitoring to reduce fraud and enhance reporting efficiency and transparency (Huang, 2025; Saheb et al., 2025).

AI-driven tools also support financial transparency and governance, as they enhance risk management, compliance, fraud detection, and stakeholder engagement, and big-data algorithms improve financial control and risk warning in complex organizations (Andronie et al., 2023; Dashkevich et al., 2024; Nofel et al., 2024; Sedlmeir et al., 2022). However, blockchain transparency and AI ethics projects highlight frictions between radical visibility, data privacy, and regulatory considerations, as they claim that permissioned chains, zero-knowledge proofs, and explainable AI are required to balance transparency, confidentiality, and fairness in digital reporting systems (Javaid et al., 2022; Radanliev, 2025; Tsolakis et al., 2023).

2.2. ESG Disclosure Quality

In ESG reporting, transparency, quantifiable quality, timeliness, and comprehensiveness are crucial to producing ESG disclosures that usefully inform decisions. Transparency is connected to understandable similar information in a company's other reports that decreases information asymmetry and establishes responsibility; a high level of ESG performance is likely to be accompanied by disaggregated and more detailed financial reporting and an overall elevated level of transparency in reporting (Ferdous et al., 2025; Nyakuwanika and Panicker, 2025). The quality of reporting has become increasingly multidimensional, encompassing not only data volume but also key attributes such as relevance, accuracy, completeness, comparability, clarity, and neutrality alongside readability and depth of narrative disclosure. These dimensions are typically guided by frameworks that integrate traditional accounting principles with specialized ESG checklists and scoring systems (Arvidsson and Dumay, 2022; Bogdan et al., 2023; Shaikh, 2022; Yip and Yu, 2023).

The length, completeness, and readability of the text are text-based measures that proxy the quality of disclosure and positively correlate with higher ESG ratings and more transparent nonfinancial reporting (Huang et al., 2024; Yip and Yu, 2023). Timeliness is emphasized as an important data-quality characteristic, and guidelines and stock-exchange regulations tend to compel ESG reporting shortly after annual reporting, whereas academics demand more current, future-looking, even real-time ESG data, particularly in relation to climate risk and Industry 5.0 technologies (Arvidsson and Dumay, 2022; Nyakuwanika and Panicker, 2025; Yadav et al., 2024).

Comprehensiveness is measured through coverage of ESG pillars and particular sets of key performance indicators (KPIs) (e.g., environmental KPIs and European sustainability reporting standards (ESRS) topics), with researchers often identifying unbalanced reporting (strong on climate or strategy, weak on business model, natural resources, or social topics), especially in Small and Medium-sized Enterprises (SMEs) and smaller firms (Bogdan et al., 2023; Suta et al., 2025; Yip and Yu, 2023). On the whole, the literature claims that only timely, comprehensive, high-quality ESG disclosure in these dimensions can actually improve transparency and assist investors, regulators, and other stakeholders in making sustainability decisions (Arvidsson and Dumay, 2022; Bogdan et al., 2023; Nyakuwanika and Panicker, 2025).

2.3. Investor Confidence

Generally, ESG and sustainability disclosure is linked to increased investor confidence, firm value, and more sustainability-oriented investment decisions, albeit with different impacts depending on context. Enhanced ESG disclosure improves REITs' access to capital and reduces their cost of debt, in turn increasing firm value and providing an indicator of reduced risk to lenders and investors (Misiuda and Lachmann, 2022). In the case of listed firms more generally, improved ESG performance and disclosure are likely to raise market value, and this financial performance constitutes a significant aspect of how ESG is converted into higher valuation (Xue, 2025). The topics covered and the textual characteristics of sustainability reports are important; reports with a focus on specific issues (e.g., healthcare, daily needs) and those with a more readable format are associated with a higher Tobin's q and a more significant positive effect of ESG ratings on firms' value, meaning that investors are responsive not only to ESG ratings but also to how information is presented (Feng and Wu, 2023; Zhou et al., 2022).

ESG disclosure also influences market responses around major events; in some markets, mandatory sustainability regulations can lead to a positive stock response (Nampoothiri et al., 2024), sustainability awards can lead to short-term abnormal returns by signaling credible commitment (Ahmad et al., 2024), and ESG reporting before IPOs can reduce underpricing due to reduced perceived risk and information asymmetry (Moussa and Elmarzouky, 2024). Simultaneously, UK companies have demonstrated that ESG reporting—and carbon disclosure in particular—reduce uncertainty in the market, which leads to a decrease in the cost of capital and increased investor confidence (Rahmiyati et al., 2025). Experimental and archival studies confirm that investors do consider sustainability reporting when making their decisions, although the impacts are contingent on the credibility of disclosure (e.g., assurance and precision) and on similar and consistent frameworks (Moolkham, 2024; Rao et al., 2025).

Digital transformation strengthens ESG disclosure and, through this channel, supports investor trust and confidence. Evidence from Chinese listed firms shows that corporate digitalization significantly improves both the extent and quality of ESG disclosure, mainly by enhancing data collection, internal controls, and green innovation, thereby increasing transparency for external stakeholders. Higher-quality ESG reporting, captured through disclosure indices, readability, verification practices, or external ratings, is consistently associated with better firm performance, lower financing costs, and higher firm value, indicating that investors reward credible and decision-useful ESG information (Arvidsson and Dumay, 2022; Feng and Wu, 2023; Huang et al., 2025; Zhou et al., 2022). Several studies directly link richer ESG disclosure with reduced market uncertainty, lower idiosyncratic risk, and less IPO underpricing, showing that more transparent sustainability reports decrease information asymmetry and perceived risk, which in turn boosts investor trust and access to capital (Ferri et al., 2023; Khandelwal et al., 2023; Moussa and Elmarzouky, 2024; Reber et al., 2021).

Because digital transformation enhances ESG disclosure, it fosters investor trust and confidence. The experience of Chinese listed companies demonstrates that corporate digitalization can considerably increase the level and quality of ESG disclosure, primarily through the improvement of data collection, internal controls, and green innovation, which increase transparency to external stakeholders (Sun et al., 2025). Better firm performance, reduced financing cost, and firm value are consistently found to relate to higher-quality ESG reporting as measured by disclosure indices, readability, and verification practice or external ratings (Ali et al., 2025; Arvidsson and Dumay, 2022; Darnall et al., 2022; Feng and Wu, 2023; Huang et al., 2025). A number of studies directly correlate enhanced ESG disclosure with lower market uncertainty, decreased idiosyncratic risk, and less IPO underpricing and establish that more transparent sustainability reports reduce information asymmetry and perceived risk, which subsequently leads to increased investor confidence and access to capital (Ferri et al., 2023; Khandelwal et al., 2023; Moussa and Elmarzouky, 2024; Reber et al., 2021).

This mechanism is further reinforced by ESG-oriented investors, whose existence and preferences not only encourage firms to disclose more but also moderate the effects of ESG disclosure on financial performance, making effective use of ESG reporting as a trust-building tool (Park and Jang, 2021). Recent research directly captures investor confidence as a mediating variable, concluding that good ESG performance positively influences investor confidence, which in turn mediates some of ESG reporting's positive impact on firm value (Zhou et al., 2022).

Although a growing body of literature explores digital transformation, ESG disclosure, and investor-related outcomes, a large research gap persists regarding the interaction of these constructs in an integrated model. The extant literature mostly examines digital transformation and ESG disclosure separately, with little attempt to clarify how digitalization enhances disclosure quality and consequently affects investor confidence. Some evidence indicates that digital transformation does improve ESG performance and reporting practices, but the quality of the relationship between the two appears to be highly context specific and not universal across institutional contexts. Additionally, despite the general view that ESG disclosure is linked to decreased information asymmetry and enhanced firm value, the empirical evidence on its financial effects is inconclusive, with some studies showing that ESG disclosure is not associated with a reduction in information asymmetry or is even associated with negative short-term financial effects. Notably, the intermediary role of the quality of ESG disclosure, especially in transparency, timeliness, and comprehensiveness, has not been adequately addressed in the context of the connection between digital transformation and investor confidence, particularly in emerging markets, where reporting practices remain in the developmental stage and are frequently not standardized. With that in mind, a detailed empirical model that incorporates these variables and studies their relationships in a particular institutional context is an apparent necessity.

3. RESEARCH METHODOLOGY

3.1. Introduction

This research adopted a quantitative research methodology to examine the effect of digital transformation on the quality of ESG disclosure and on investors' confidence level, employing a survey methodology to gather primary data from the target population (Creswell, 2014). Statistical analysis was conducted to examine the relationships and interaction effects among the study variables.

$$CL = \frac{UL - LL}{K} = \frac{5-1}{3} = 1.33 \approx 1.5$$

- CL = Class length
- UL = Upper limit of alternatives
- LL = Lower limit of alternatives
- k = Number of levels (classes)

Table 1 shows the criteria for the mean scores of the respondents' answers on a 5-point Likert scale. The responses are separated into three levels (low, moderate, and high) according to a range of specific values drawn from the class length formula. The length of classes was determined as the difference between the maximum and minimum values of the scale divided by the number of levels, giving approximately 1.5, which was then used to calculate the category intervals. The interpretation of mean scores follows equal interval classification based on Likert scale analysis (Creswell, 2014), wherein responses are grouped into Low (1.00-2.33), Moderate (2.34-3.67), and High (3.68-5.00). The classification offers a clear, systematic method of interpreting the mean values, enabling the researchers to effectively evaluate the degree of agreement between the respondents and make meaningful conclusions about the study variables.

3.2. Research Design

The study is a descriptive-analytical work that explains the extent of digital transformation among Saudi businesses, its connection to the quality of ESG disclosure, and its effect on investor trust. The design enables integrating quantitative description of the phenomenon with statistical analysis of the effects between variables.

3.3. Data Collection Tools

A group of listed Saudi companies constituted the purposive sample for data collection based on an online survey of accountants, financial managers, and sustainability officers. The analysis used SPSS software to obtain the means and standard deviations (SDs) of each dimension of the study. Subsequently SmartPLS software was used for partial least squares structural equation modeling (PLS-SEM) to test the effects between variables and confirm the hypotheses, including the role of disclosure quality as an intermediary variable between digital transformation and investor confidence.

3.4. Study Population and Sample

The studied population comprised employees in the finance, accounting, sustainability, and IT departments of Saudi companies listed on the Saudi stock exchange. These groups are the most involved with digital transformation and sustainability disclosure (ESG) practices. Stratified random sampling was applied to ensure equal representation of the different target groups. The sample size of 390 participants is sufficient to achieve an acceptable level of precision and to allow for the generalization of the findings to the study population.

3.5. Characteristics of the Study Sample

We calculated the frequencies and percentages of the study sample respondents' general information, including demographic details such as gender, age, education level, and job title.

Table 2 shows that males were the majority gender at 52.8%, with females accounting for 47.2%. Regarding age, the largest group of respondents (41.8%) were those aged 30-40 years, followed by those aged 40-50 years (34.9%) and those <30 years old (13.6%), with those more than 50 years old being the smallest group (9.7%). Financial manager was the most common job title (36.4%), followed by accountant (24.1%), sustainability officer (23.3%), and IT employee (16.2%). Finally, regarding educational level, the largest group (35.4%) held a master's or PhD degree, followed by those with a bachelor's degree (33.1%) and those holding a diploma (31.5%).

Table 1: Level degree

Mean score range	Level of agreement
1.00-2.33	Low
2.34-3.67	Moderate
3.68-5.00	High

Table 2: Demographic profile of the respondents (n=390)

Variable	Category	Frequency	Percentage
Gender	Male	206	52.8
	Female	184	47.2
Age	<30 years	53	13.6
	From 30 to 40 years	163	41.8
	From 40 to 50 years	136	34.9
	More than 50 years	38	9.7
Job title	Accountant	94	24.1
	Financial manager	142	36.4
	Sustainability officer	91	23.3
	IT employee	63	16.2
Education level	Bachelor	129	33.1
	Diploma	123	31.5
	Master/PhD	138	35.4

3.6. Description of Study Variables

Table 3 clearly indicates the study variables' different levels of significance based on their mean scores. The first variable group (digital transformation) contains the variable with the highest level of importance (3.83 for digital reporting systems) as well as AI/Blockchain (3.64) and Big Data (3.56) at the moderate level, which shows that organizations are more concerned with digital reporting systems than with other digital transformation tools. In the second variable group (Quality of ESG Disclosures), Timeliness scores high (3.70), and transparency and accuracy (3.62) and comprehensiveness (3.66) score moderately, implying that timely disclosure is the most important aspect of the quality of ESG reporting. In the third variable group (investor confidence), all the dimensions (trust, 3.37; credibility, 3.59; investment willingness, 3.40) are at the moderate level, indicative of the respondents' fairly balanced yet weak appraisal of investor confidence. On the whole, the results suggest that the majority of the studied variables are at a moderate level, with only a few dimensions being on a high level, indicating the need to improve the situation in a few areas, especially the integrity of investor trust, the more general areas of digital transformation, and the quality of ESG disclosure.

3.7. Validity Test

3.7.1. Validity of the evaluation among the evaluators

The researchers concluded that a questionnaire was the most appropriate method of data collection after surveying all the theoretical literature and past studies. After the construction of the questionnaire and its items, a group of experts reviewed the questionnaire to ensure that it was valid, clear, and appropriate to the aims of the study. The specialists rated the items in terms of their relevance, clarity, and ability to measure the desired concepts

and offered recommendations for improving the questionnaire, including adding, removing, or rephrasing some statements. The researchers made the required modifications to the questionnaire according to the experts' comments, which involved modifying 85% of the information, after which the final version of the questionnaire was distributed to the study's participants.

3.7.2. Internal consistency of questionnaire statements

Internal consistency was calculated by determining the Pearson correlation coefficient between the score of each statement and the total score of the axis to which the statement belonged. Table 4 shows the results.

Table 4 shows that the correlation coefficients between the statements and the total score of the dimension to which they belong in the first axis (Digital Transformation) are all statistically significant at the 0.01 significance level, ranging from 0.705 to 0.870. They range from 0.702 to 0.866 in the second axis (Quality of ESG Disclosures) and from 0.612 to 0.897 in the third axis (Investor Confidence), indicating a high level of internal consistency validity for the statements of the first axis in the questionnaire.

3.8. Reliability Test

The Cronbach's alpha reliability coefficient for the questionnaire axes and the overall questionnaire average was calculated. Table 5 shows the results.

Table 3: Means, SDs, and rank of variables

Variable	Mean	SD	Importance
First variables: Digital transformation			
Big data	3.56	0.634	Moderate
AI/Blockchain	3.64	0.618	Moderate
Digital reporting systems	3.83	0.648	High
Second variables: Quality of ESG disclosures			
Transparency and accuracy	3.62	0.640	Moderate
Timeliness	3.70	0.640	High
Comprehensiveness	3.66	0.612	Moderate
Third variables: Investor confidence			
Trust	3.37	0.631	Moderate
Credibility	3.59	0.652	Moderate
Investment Willingness	3.40	0.624	Moderate

Table indicates high reliability coefficients (Cronbach's alpha) for the three axes, ranging from 0.842 to 0.933. These values show that the questionnaire axes are quite reliable and their results may be trusted.

4. EMPIRICAL RESULT

PLS-SEM was conducted using SmartPLS to verify this study's hypotheses. The method was chosen as an effective tool for modeling complicated structures with a high degree of predictive accuracy while examining multiple relationships simultaneously. The criteria for evaluating the models included assessment of the measurement model through composite reliability (CR) to evaluate reliability, average variance extracted (AVE) to evaluate convergence, and the Stone–Geisser Q^2 statistic to evaluate predictive relevance. These measures enable a holistic analysis of reliability, validity, and predictability of the constructs.

Table 6 shows that all constructs have high reliability and convergent validity. The Cronbach's alpha values are within the range of 0.851-0.886, denoting high internal consistency among all constructs. On the same note, the CR values (rho_a and rho_c) are higher than the suggested level of 0.70, indicating that the measurement items always reflect their respective constructs. Moreover, the AVE values range from 0.691 to 0.745, with all the values above the acceptable threshold of 0.50. This shows that all the constructs are able to explain a significant percentage of variance in their indicators and thus a satisfactory convergent validity. In general, this paper's findings indicate that the measurement model is both reliable and valid and may be used to further analyze the structural model and test the hypothesis.

As seen in Table 7, the model shows a good fit to both the saturated and the estimated models. The SRMR values of 0.040 and 0.041, respectively, are below the recommended maximum threshold of 0.08, indicating a good model fit and a satisfactory residual between the observed and predicted correlations. Furthermore, the d_ULS and d_G values of both models are not excessively large, implying that there are few dissimilarities between the empirical

Table 4: Pearson's correlation coefficient between the scores of each statement and the total score of the axis to which it belongs

Statement No.	Correlation coefficient	Statement No.	Correlation coefficient	Statement No.	Correlation coefficient
First axis: Digital transformation					
1	0.823**	2	0.800**	3	0.831**
4	0.771**	5	0.843**	6	0.705**
7	0.782**	8	0.772**	9	0.773**
10	0.824**	11	0.834**	12	0.870**
Second axis: Quality of ESG disclosures					
13	0.818**	14	0.752**	15	0.746**
16	0.783**	17	0.794**	18	0.813**
19	0.702**	20	0.731**	21	0.866**
22	0.823**	23	0.807**	24	0.783**
Third axis: Investor confidence					
25	0.815**	26	0.869**	27	0.803**
28	0.877**	29	0.865**	30	0.708**
31	0.642**	32	0.683**	33	0.612**
34	0.897**	35	0.626**	36	0.886**

**Statistically significant at the 0.01 level

data and the covariance matrices as implied by the model. The chi-squared values of 845.209 for the saturated model and 880.871 for the estimated model also indicate a reasonable level of model fit, and only a small increase in the estimated model is expected. In addition, the values of the normed fit index (NFI) (0.896 and 0.892, respectively) are near the recommended value of 0.90, indicating a good fit. In general, these findings show that the proposed model exhibits a satisfactory goodness-of-fit and is suited to undergo additional structural analysis and hypothesis testing.

Figure 1 visually presents the structural model without the mediator variable, while Table 8 shows that each of the hypothesized relationships between the independent variables (AI/Blockchain, Big Data, and Digital Reporting Systems) and the dependent variables (Credibility, Investment Willingness, and Trust) have a statistically significant relationship at the 0.01 level as indicated by the *t*-statistics and P-values (0.000). AI/Blockchain has a strong positive correlation with Credibility (β = 0.306), Investment Willingness (β = 0.282), and Trust (β = 0.334), with moderately significant effect sizes (0.078-0.131), indicating that it is helpful in improving investor perceptions. In the case of Big Data, the findings also support a significant positive impact on Credibility (β = 0.228), Investment Willingness (β = 0.267), and Trust (β = 0.250), with small to moderate magnitude of effects, indicating a consistent but less powerful effect as compared to the other dimensions of digital transformation. Similarly, Digital reporting systems has the largest impact of any predictor, with the highest path coefficients on Credibility (β = 0.429), investment willingness (β = 0.392), and Trust (β = 0.376) and the largest effect sizes (up to 0.247), illustrating its dominant influence on investor-related outcomes. The R^2 values suggest that the model fits well and that, overall, the Digital Transformation variable explains a significant share of variance in Credibility ($R^2 = 0.849$), Trust ($R^2 = 0.844$), and Investment Willingness ($R^2 = 0.812$). Comprehensively, the results demonstrate a strong and positive impact of all the dimensions of digital transformation on investor confidence indicators, with Digital Reporting Systems being the most impactful predictor in the model.

Table 5: Cronbach's alpha reliability coefficient for the questionnaire axes

Axis	Items	Cronbach's alpha
First axis: Digital transformation	12	0.842
Second axis: Quality of ESG disclosures	12	0.844
Third axis: Investor confidence	12	0.933

Table 6: Composite reliability and convergent validity results

Construct	Cronbach's alpha	CR (rho_a)	CR (rho_c)	AVE
AI/Blockchain	0.857	0.857	0.903	0.699
Big data	0.878	0.880	0.916	0.733
Credibility	0.870	0.872	0.911	0.720
Digital reporting systems	0.875	0.878	0.915	0.728
Investment Willingness	0.851	0.851	0.899	0.691
Trust	0.886	0.888	0.921	0.745

Table 7: Model fit indices for the saturated and estimated models

Fit index	Saturated model	Estimated model
SRMR	0.040	0.041
d_ULS	0.474	0.516
d_G	0.417	0.443
Chi-squared	845.209	880.871
NFI	0.896	0.892

As may be seen in Table 9, each construct in the extended model has high reliability and convergent validity levels. Cronbach's alpha values range from 0.851 to 0.886, showing high internal consistency among all the measurement items. On the same note, the CR coefficients (rho_a and rho_c) are greater than the recommended value of 0.70, confirming that the constructs are reliably and consistently measured. In terms of convergent validity, the AVE values (0.691-0.745) are all greater than the acceptable threshold of 0.50, indicating that both constructs explain a significant amount of the variance in their indicators and confirming that the measurement items suitably reflect the theoretical constructs behind them. On the whole, these findings substantiate that including the mediator variable does not impair the reliability or validity of the measurement model. Rather, the model exhibits strong psychometric qualities, supporting its applicability in the next stages of structural analysis and mediation tests.

As shown in Table 10, the overall model has a satisfactory goodness-of-fit with the addition of the mediator variable. The SRMRs of the saturated model (0.036) and the estimated model (0.037) are less than the recommended value of 0.08, indicating

Table 8: Effects, significance, and effect sizes without the mediator variable

Path	Original sample (O)	Sample mean (M)	SD	*t*- statistic	f^2	P-value	Result
AI/Blockchain -> Credibility	0.306	0.307	0.045	6.732	0.114	0.000	Significant
AI/Blockchain -> Investment Willingness	0.282	0.282	0.055	5.170	0.078	0.000	Significant
AI/Blockchain -> Trust	0.334	0.334	0.046	7.309	0.131	0.000	Significant
Big data -> Credibility	0.228	0.227	0.043	5.292	0.059	0.000	Significant
Big data -> Investment Willingness	0.267	0.266	0.054	4.930	0.066	0.000	Significant
Big data -> Trust	0.250	0.250	0.042	5.969	0.069	0.000	Significant
Digital Reporting Systems -> Credibility	0.429	0.430	0.047	9.211	0.247	0.000	Significant
Digital Reporting Systems -> Investment Willingness	0.392	0.393	0.047	8.323	0.165	0.000	Significant
Digital Reporting Systems -> Trust	0.376	0.377	0.045	8.452	0.183	0.000	Significant

R^2 (Credibility)=0.849, R^2 (Investment Willingness)=0.812, R^2 (Trust)=0.844

Table 9: Composite reliability and convergent validity results including the mediator variable

Construct	Cronbach's alpha	CR (rho_a)	CR (rho_c)	AVE
AI/Blockchain	0.857	0.857	0.903	0.699
Big data	0.878	0.881	0.916	0.733
Comprehensiveness	0.854	0.855	0.901	0.695
Credibility	0.870	0.871	0.911	0.720
Digital reporting systems	0.875	0.878	0.915	0.728
Investment Willingness	0.851	0.851	0.899	0.691
Timeliness	0.882	0.882	0.919	0.738
Transparency and acscuracy	0.878	0.882	0.916	0.733
Trust	0.886	0.888	0.921	0.745

Table 10: Model fit indices for the saturated and estimated models including the mediator variable

Fit index	Saturated model	Estimated model
SRMR	0.036	0.037
d_ULS	0.870	0.932
d_G	0.772	0.807
Chi-squared	1554.368	1589.797
NFI	0.881	0.878

a strong fit and low degree of residual difference between the observed and predicted correlations. Moreover, neither the d_ULS nor the d_G value significantly changes between the saturated and estimated models, which indicates that the proposed model is quite close to the observed data structure, even with the addition of the mediating construct. The Chi-squared values (1554.368 in the saturated model and 1589.797 in the estimated model) demonstrate reasonable model fit, with a slightly increasing value as a result of model complexity. Furthermore, the NFI values (0.881 and 0.878, respectively) are somewhat lower than the desirable value of 0.90 but show an acceptable fit of the model. In general, these findings confirm that including the mediating construct results in a satisfactory model fit, confirming the strength and consistency of the structural model for continued hypothesis and mediation testing.

Figure 2 illustrates the structural model incorporating the mediator variable, while Table 11 demonstrates that the structural model with the mediating variable reveals a detailed pattern of significant relationships among the study constructs, with most paths being statistically significant at the 0.01 level. Regarding the direct AI/Blockchain effects, the findings reveal many positive impacts on all dimensions (Comprehensiveness, 0.314; Credibility, 0.306; Investment Willingness, 0.282; Timeliness, 0.267; Transparency and Accuracy, 0.237; and Trust, 0.334), meaning that AI/Blockchain has a stable and significant impact on improving the quality of ESG disclosure and investor trust.

On the same note, Big Data shows a strong positive impact on all constructs, with Timeliness (β = 0.374) and Transparency and Accuracy (β = 0.300) showing the greatest impact and the other dimensions displaying moderate impacts, which shows the relevance of data-driven systems in enhancing efficiency and credibility when it comes to disclosure. In the case of Digital Reporting Systems, the findings indicate the most significant and stable effects across all predictors, especially on transparency and accuracy (0.417) and comprehensiveness (0.402), which proves its pivotal role in enhancing the quality of ESG disclosure and its impact on investor-related outcomes.

Regarding the mediating constructs, comprehensiveness demonstrates very strong positive effects on credibility (β = 0.166), investment willingness (β = 0.234), and trust (β = 0.197), which shows its great relevance in conveying the impacts of digital transformation to outcomes of investor confidence. The effects of Transparency and Accuracy on Credibility (β = 0.206), investment willingness (β = 0.144), and trust (β = 0.192) also indicate that it is a mediating variable. Nevertheless, only Credibility is significantly influenced by Timeliness (β = 0.097, P = 0.035), whereas Timeliness has no statistically significant impact on Investment Willingness and Trust, which indicates a less important role in these correlations. On the whole, the R^2 values with a range of 0.821-0.869 confirm the model's high explanatory power, which validates the hypothesis that the proposed model can explain a significant percentage of variance in the quality of ESG disclosure and investor confidence dimensions. All these results support the strength of the structural model and the predominance of Digital Reporting Systems as well as the partial mediating effect of the ESG disclosure dimensions on the outcomes of investor confidence.

5. DISCUSSION

The outcomes of this study provide a great deal of empirical evidence regarding the significance of digital transformation elements in improving the quality of ESG disclosure practices and fostering investor confidence. In terms of descriptive statistics, the respondents rated all the research variables from moderately well to very well. Digital reporting systems obtained the highest score of all the digital transformation dimensions, showing that more and more firms use sophisticated digital reporting approaches to make their reports understandable and accessible.

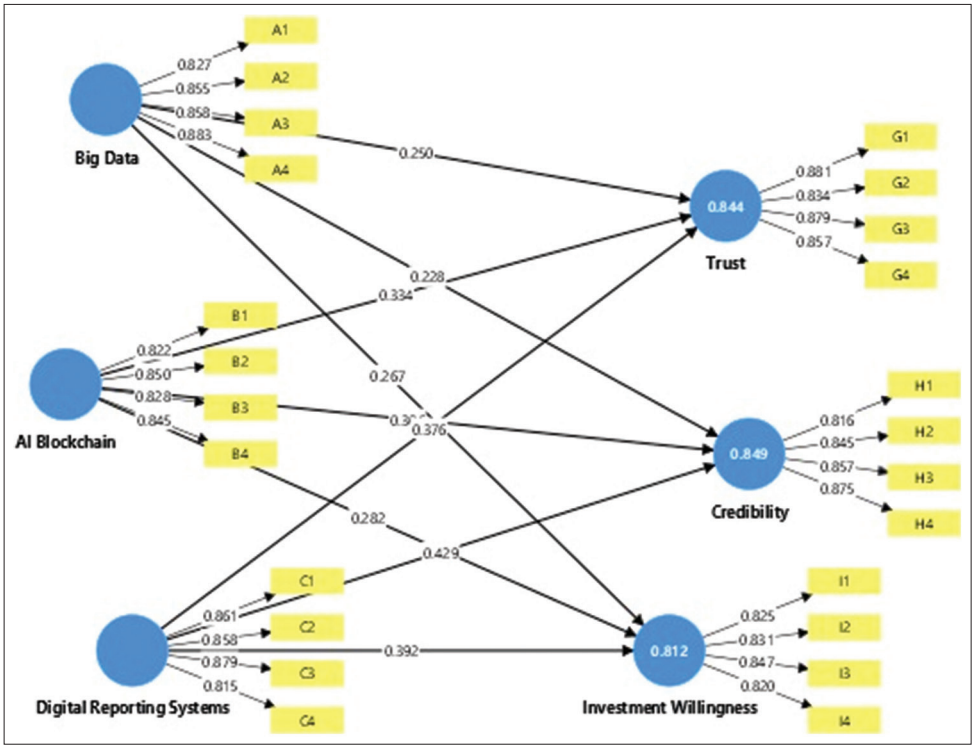
In addition, the structural models show that all the hypothesized relations are statistically significant. Thus, the theory used by the researchers is consistent and strongly validated through statistical analysis. As regards to the structural importance of the dimension, the results prove that digital reporting systems has the greatest impact on both constructs under investigation. Therefore, well-structured, technological-based ways of disclosing ESG information are especially significant for investors' confidence and decision-making process.

Table 11: Effects, significance, and effect sizes including the mediator variable

Path	Original sample (O)	Sample mean (M)	SD	t- statistic	f^2	P-value	Result
AI/Blockchain -> Comprehensiveness	0.314	0.313	0.048	6.508	0.102	0.000	Significant
AI/Blockchain -> Credibility	0.306	0.307	0.045	6.723	0.039	0.000	Significant
AI/Blockchain -> Investment Willingness	0.282	0.283	0.055	5.166	0.021	0.000	Significant
AI/Blockchain -> Timeliness	0.267	0.268	0.046	5.825	0.081	0.000	Significant
AI/Blockchain -> Transparency and Accuracy	0.237	0.238	0.045	5.312	0.063	0.000	Significant
AI/Blockchain -> Trust	0.334	0.334	0.046	7.306	0.047	0.000	Significant
Big Data -> Comprehensiveness	0.231	0.231	0.052	4.470	0.052	0.000	Significant
Big Data -> Credibility	0.228	0.227	0.043	5.302	0.009	0.000	Significant
Big Data -> Investment Willingness	0.267	0.266	0.054	4.921	0.015	0.000	Significant
Big Data -> Timeliness	0.374	0.372	0.046	8.185	0.150	0.000	Significant
Big Data -> Transparency and Accuracy	0.300	0.299	0.047	6.432	0.094	0.000	Significant
Big Data -> Trust	0.250	0.249	0.042	5.966	0.013	0.000	Significant
Comprehensiveness -> Credibility	0.166	0.166	0.046	3.598	0.032	0.000	Significant
Comprehensiveness -> Investment Willingness	0.234	0.236	0.053	4.424	0.050	0.000	Significant
Comprehensiveness -> Trust	0.197	0.198	0.047	4.177	0.044	0.000	Significant
Digital Reporting Systems -> Comprehensiveness	0.402	0.404	0.050	7.970	0.182	0.000	Significant
Digital Reporting Systems -> Credibility	0.429	0.429	0.047	9.207	0.069	0.000	Significant
Digital Reporting Systems -> Investment Willingness	0.392	0.393	0.047	8.313	0.038	0.000	Significant
Digital Reporting Systems -> Timeliness	0.316	0.317	0.046	6.925	0.125	0.000	Significant
Digital Reporting Systems -> Transparency and Accuracy	0.417	0.417	0.046	9.059	0.212	0.000	Significant
Digital Reporting Systems -> Trust	0.376	0.377	0.045	8.449	0.038	0.000	Significant
Timeliness -> Credibility	0.097	0.097	0.046	2.111	0.011	0.035	Significant
Timeliness -> Investment Willingness	0.099	0.099	0.055	1.798	0.009	0.072	Not Significant
Timeliness -> Trust	0.097	0.097	0.050	1.939	0.010	0.053	Not Significant
Transparency and Accuracy -> Credibility	0.206	0.205	0.049	4.238	0.047	0.000	Significant
Transparency and Accuracy -> Investment Willingness	0.144	0.143	0.055	2.612	0.018	0.009	Significant
Transparency and Accuracy -> Trust	0.192	0.192	0.047	4.135	0.040	0.000	Significant

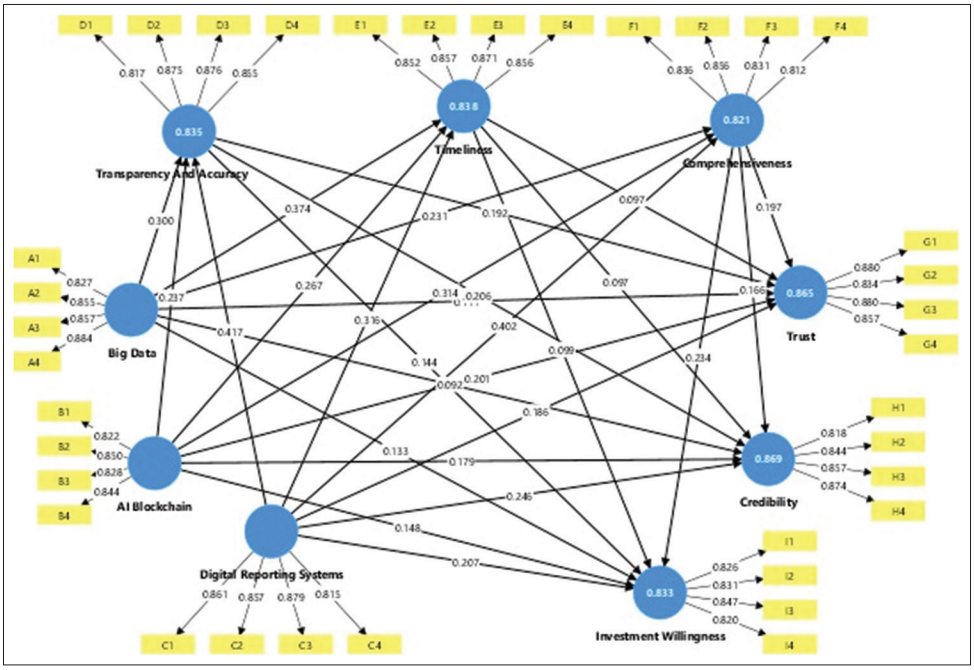
R^2 (Comprehensiveness)=0.821, R^2 (Credibility)=0.869, R^2 (Investment Willingness)=0.833, R^2 (Timeliness)=0.838, R^2 (Transparency and Accuracy)=0.835, R^2 (Trust)=0.865

Figure 1: Structural model without the mediator variable



Moreover, Big Data exhibited a positive influence on all dependent variables, although the magnitudes of its effects were lower than those of the other independent variables. This demonstrates that data analytics may be highly beneficial in enhancing the efficiency of the ESG disclosure process, although the use of such technology would be most effective in combination with an entire digital reporting platform.

Figure 2: Structural model including the mediator variable



AI/Blockchain exhibited a substantial and consistent influence on all constructs, although it demonstrated the strongest influence on the constructs related to trust. Such results emphasize the importance of using blockchain-based technology to ensure accuracy, traceability, and reliability, which are important determinants in evaluating investors' perceptions of the ESG reporting process.

The features of ESG reports, particularly comprehensiveness, transparency, and accuracy, were instrumental in converting the implications of digital transformation into results concerning investor trust. However, Timeliness played a minor role, which means that while the timeliness of the disclosure process is crucial, it cannot be enough to affect investors' level of readiness to invest and their belief in the disclosure process unless the information is comprehensive and accurate. Overall, the model was efficient in explaining the phenomenon under study. Thus, it can be inferred that the combination of the elements of digital transformation forms a strong basis for the discussed differences in the quality of ESG reports and investor trust.

6. CONCLUSION

Digital transformation emerges from this study as a key driver of enhanced ESG disclosure quality and increased investor confidence. Among the technological factors examined, digital reporting systems play the most critical role, supported by complementary technologies such as artificial intelligence, blockchain, and big data. The findings indicate that the primary contribution of digital transformation lies in improving the comprehensiveness and credibility of ESG disclosures, which directly strengthens investor trust and investment willingness. While timeliness also contributes positively, it is not sufficient on its own, emphasizing the importance of delivering accurate, complete, and reliable ESG information within appropriate time frames.

Furthermore, the study provides practical evidence that its proposed framework can be effectively applied in real corporate environments. The results suggest that organizations seeking to enhance investor confidence should prioritize the adoption of advanced digital accounting and reporting systems, particularly those leveraging blockchain and big data technologies. However, the study is constrained by its focus on selected digital tools and ESG dimensions as well as by its reliance on cross-sectional data, which may limit generalizability and causal interpretation. Despite these limitations, the findings offer valuable insights for corporate managers and policymakers on leveraging digital transformation to strengthen ESG reporting practices and support sustainable investment outcomes.

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