

Research on the Impact of Enterprise Digital Transformation on ESG Performance -- Based on the Perspective of External Concern

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Abstract. According to the resource-based view, signaling theory and information asymmetry theory, this study empirically explores how digital transformation can influence enterprise ESG performance. Thus, this study examines Chinese A-share firms listed between 2017 and 2023 and uses the two-way fixed effect model and the mediation effect test method, focusing on how media attention and analysts' attention mediate this relationship. The study found that digital transformation significantly improved the corporate ESG performance; Media attention and analyst attention play a part in the intermediary effect, and the transmission role of media attention is more prominent. Research shows a positive impact of digital transformation on ESG performance through internal governance optimization, and also forms an effective external supervision and reputation transmission mechanism by improving information transparency and attracting the attention of external markets. This study provides theoretical support and management enlightenment for enterprises to optimize resource allocation in the process of digitalization and improve the ESG practice level with the help of an external governance mechanism.

Keywords: Digital Transformation, ESG Performance, Media Attention, Analysts' Attention, External Governance Mechanism.

1. Introduction

Nowadays, the convergence of digitalization and sustainability agendas is increasingly pronounced. Sustainable development and the digital economy are now deeply intertwined. Against this background, enterprises increasingly leverage digital transformation as a strategic tool to enhance their ESG outcomes. In this context, digital transformation drives business model innovation. This process, along with the transformation itself, profoundly changes enterprises' value creation path through reshaping the way of resource allocation. At the same time, as ESG rating systems gain increasing popularity, enterprises can no longer focus solely on changes in market competition brought about by digital transformation. These changes include shifts in consumer behavior patterns and the structural reconstruction of multi-industry markets [1]. Instead, enterprises need to leverage digital technologies as a core capability to improve their comprehensive performance across ESG dimensions. Digitalization, therefore, emerges as a crucial strategic tool enabling enterprises to reallocate resources, strengthen operational efficiency, and meet ESG demands in the capital market. Thus, at this moment when digital economy and sustainable development meet, it has important theoretical and practical value to explore the way that digital transformation affects enterprise ESG performance.

Existing studies have laid an important foundation for exploring how digitalization interacts with firms' ESG profiles. Digitalization can significantly improve corporate ESG standings, as Song pointed out [2]. Enterprises can not only obtain social recognition, but also capital income, thus forming a virtuous circle. Wang further studied and found that this promotion effect is easier to achieve in the innovation-oriented private sector and enterprises owned by the state [3]. Hu supplemented the above view from the perspective of mechanism, and believed that digital transformation could promote the ESG performance of enterprises through three channels: green technology innovation, internal information transparency improvement and decision-making and operation efficiency improvement [4]. Although the above research reveals the impact mechanism of

digital transformation on ESG performance from multiple dimensions, most of them focus more on the perspective of internal governance and pay less attention to the conduct role of the external governance mechanism. The changes in the information environment caused by the digital transformation are often transmitted to the capital market through external channels such as media attention and analyst tracking, and then affect the corporate ESG outcomes. However, less attention has been paid to whether external mechanisms like media attention play an intermediary role linking digitalization to ESG outcomes. Based on this, this paper explores how media and analyst coverage mediate the digitalization - ESG nexus. Using Chinese A-share firms spanning 2017 through 2023, this paper examines how digital transformation affects ESG performance, specifically tracing through the transmission channels operated by analysts and media. The theoretical contribution lies in introducing external governance mechanisms to reveal how digital transformation improves ESG performance by attracting external market attention, complementing existing research that mainly focuses on internal factors such as green innovation and information disclosure. Practically, this study offers enterprises an operable path to enhance ESG performance through digital transformation by not only improving internal efficiency but also leveraging external attention through active communication with media and analysts to gain social support and financial favor.

2. Theoretical Analysis and Assumptions

2.1. Digitalization's Direct Impact on ESG Performance

According to resource-based theory, digital transformation enhances information processing efficiency and helps enterprises build competitive advantages. By continuously collecting and analyzing heterogeneous data, this efficiency enables the formation of unique data assets and intelligent decision-making systems that are scarce and difficult to imitate. From the perspective of signaling theory, it improves information transparency and enables enterprises to transmit ESG efforts to external stakeholders. By leveraging technologies like blockchain and IoT to make ESG data collection and disclosure tamper-proof, it enhances signal credibility and reduces external investors' screening costs. Traditional corporate governance theory suggests that digital transformation promotes the digitalization of internal decision-making processes, curbing managerial opportunism. These effects collectively strengthen market feedback and improve governance efficiency.

According to the above discussion, hypothesis 1 is posited: digital transformation exerts a positive effect on enterprise ESG performance.

2.2. Media Attention's Intermediary Role

Digitalization increases enterprises' news value and information disclosure quality. Such openness and persistence enhance stakeholder trust in enterprises and also provide them with richer data resources, placing them under the spotlight effect and making them more likely to attract media attention [5]. Media attention then exerts external supervision and reputation effects, forcing enterprises to correct ESG-related misconduct and motivating them to improve ESG performance. This market feedback mechanism further encourages continuous ESG investment. Thus, media attention serves as a channel via which ESG outcomes are shaped by digitalization.

Hypothesis 2 is then proposed: Media attention functions as a transmission mechanism bridging digitalization and corporate ESG outcomes.

2.3. Intermediary Role of Analysts' Attention

Before the digital transformation, the efficiency of enterprise information processing was low, and a large amount of information could only be deposited inside the system and could not be effectively used [6]. Digital transformation improves information transparency and disclosure quality. According to information asymmetry theory, this reduces analysts' information search costs and makes it easier for them to focus on these enterprises. Analysts then play multiple roles. They mine ESG-related data and link it to long-term enterprise value, while also forming external supervision through forecasts

and tracking. Their professional interpretation delivers more information to investors. Thus, hypothesis 3 is proposed: Analysts' attention mediates between digital transformation and enterprise ESG performance.

3. Rigorous Research Design on Variables

3.1. Sampling and Data Collection

Data accessibility and quality guide the selection of Chinese A-share firms spanning 2017 through 2023 as a sample for empirical analysis. The data to measure ESG performance is from the CSG rating, and the rest, such as media and analyst data, are sourced from the CSMAR and related enterprise annual reports. In this paper, data processing proceeds in three stages: first, distressed firms such as ST and delisting companies are eliminated; Second, only samples without missing data for no fewer than five years in a row are retained, and finally gets a total of 11285 sample data.

3.2. Variable Specifications

3.2.1. Dependent Variable: Enterprise ESG performance

Huazheng ESG rating index is selected to estimate the enterprises' ESG performance. The rating covers three dimensions of environment, society, and governance, and has multiple sub-indicators. The scale comprises nine tiers ranging from AAA (highest) through AA and A down to CCC, CC, and C (lowest), which is mapped to a 1–9 numerical scale here in this paper. Higher scores correspond to superior ESG standings.

3.2.2. Independent Variable: Digital Transformation

Following Meng et al. [7], textual analysis is employed here to build an enterprise digitalization degree index, and uses Python crawler technology to crawl the transformation-related keywords from annual reports. By summing up the above keyword counts in the annual reports, the natural logarithm of the total plus 1 is used to construct the index of the degree of enterprise digital transformation. Greater indicator values reflect higher digitalization levels.

3.2.3. Mediating Variable: Media and Analyst

Elevated digitalization levels enhance operational transparency, making it easier for it to enter the media's field of vision, thus motivating firms to prioritize ESG improvements. Therefore, this paper selects media attention as one of the intermediary variables, and takes the number of reports involving enterprise names in the CNRDS database as the proxy variable of media attention.

Firms exhibiting advanced digitalization demonstrate elevated internal data transparency, which makes it easier for analysts to obtain and interpret relevant information, indirectly promoting enterprises' ESG performance. Therefore, this paper selects analysts' attention as one of the mediating variables, and takes the number of analysts tracking and publishing research reports in the CSMAR database as the proxy variable of analysts' attention.

3.2.4. Control Variable

To improve the research accuracy, a series of control variables were added in this article. Including Age, Size (natural logarithm of year-end total assets), Year, Industry, ROA (net profit/total assets), and SOE (state-owned enterprises assigned a value of 1, otherwise 0).

3.3. Research Model

To test H1: digital transformation exerts a positive effect on enterprise ESG performance, the following two-way fixed effects model is constructed:

$$ESG_{i,t} = \alpha_0 + \alpha_1 DT_{i,t} + \sum \gamma_j Controls_{i,t} + \mu_i + \lambda_t + \varepsilon_{i,t}$$

Among them, $ESG_{i,t}$ captures firm i 's ESG standings in period t ; $DT_{i,t}$ is the degree of digital transformation; $Controls$ is a set of control variables; μ_i is the fixed effect of individual firms; λ_t is a

fixed year effect; $\varepsilon_{i,t}$ is a random error term. A statistically significant and positive α_1 would lend support to H1.

Regarding the mediating effect, there are two other models as follows:

$$Media_{i,t} = \beta_0 + \beta_1 DT_{i,t} + \sum \gamma_j Controls_{i,t} + \mu_i + \lambda_t + \varepsilon_{i,t}$$

$$ESG_{i,t} = \delta_0 + \delta_1 DT_{i,t} + \delta_2 Media_{i,t} + \sum \gamma_j Controls_{i,t} + \mu_i + \lambda_t + \varepsilon_{i,t}$$

4. Key Empirical Results

4.1. Descriptive Statistics Analysis

Table 1. Descriptive Statistics

Variable	Obs	Mean	Med	Min	Max
ESG	11285	4.4364	4.2500	1.00	8.00
DT	11285	1.8969	1.7918	0.00	6.39
Size	11285	22.8382	22.6100	19.59	30.08
ROA	11285	0.05262	0.04890	-0.797	0.602
Age	11285	3.0152	3.0445	1.39	4.25
Analyst	11285	2.0899	2.0794	0.69	4.33
Media	11285	5.0980	4.9558	0.69	10.28

Table 1 presents summary statistics for key variables. The dependent variable exhibits a mean of 4.44 and a median of 4.25, suggesting that the sample firms generally demonstrate above-average ESG standings. Substantial difference exists across the range (min: 1.00, max: 8.00), which means that the ESG performance in the sample is significantly differentiated; DT, the primary explanatory variable, averages 1.90 with a median of 1.79, signaling relatively modest digitalization levels across the sample. The wide spread—from 0.00 to 6.39—reveals marked variation in digital maturity across firms. In terms of control variables, the average of enterprise size is 22.8382, the average of profitability (ROA) is 0.0526, and the average of enterprise age is 3.0152. The sample distribution is reasonable. As for intermediary variables, the average value of analyst tracking is 2.0899, and the average value of media attention is 5.0980, indicating that the sample enterprises are generally concerned by analysts and media reports to a certain extent.

In general, the distribution of sample data is reasonable, and there are certain differences in each variable, which is suitable for subsequent regression analysis.

4.2. Benchmark Regression Results Analysis

Table 2. Benchmark Regression

Independent Variable	Non-Standardized Coefficient beta	Standardized Coefficient beta	R ²	Significance
DT	0.068	0.107	0.081	0.000

F=165.274

To verify H1, benchmark regression was performed. As shown in Table 2, the regression coefficient of digital transformation (DT) is 0.068, which is significant at the 1% level ($p < 0.001$), and the standardization coefficient is 0.107, indicating that the ESG performance of enterprises increases by an average of 0.068 units for every unit of digital transformation. With an R² of 0.081 and an F-statistic of 165.27 ($p < 0.001$), the specification demonstrates satisfactory overall fit. This means that better digital transformation leads to better ESG performance. H1 has been verified.

As above, digital transformation can significantly improve the ESG performance. First of all, digital transformation forms unique resources and capabilities through comprehensive optimization within the enterprise, providing core support for the enterprise in ESG. Secondly, enterprises with a high degree of digitalization can achieve quality and transparency improvement of information disclosure using information technology, so as to enhance the trust of stakeholders and promote the performance of ESG. Finally, digital transformation improves the internal information processing

speed and decision-making process efficiency, making it more inclined to take into account economic benefits and social responsibility in resource allocation, and ultimately promoting the improvement of ESG performance.

4.3. Mediation Effect Test Results Analysis

Table 3. Mediation Effect Test Bootstrap

		Effect	SE	LLCI	ULCI
Total Effect		0.0586	0.0060	0.0469	0.0703
Direct Effect		0.0427	0.0059	0.0312	0.0542
Indirect Effect	Analyst	0.0068	0.0010	0.0050	0.0088
	Media	0.0093	0.0010	0.0073	0.0114

Table 3 reveals that incorporating analyst attention as a mediator yields a direct digitalization effect of 0.0427 and an indirect pathway effect of 0.0068. The indirect pathway's 95% confidence interval [0.005, 0.009] excludes zero, confirming statistical significance. The mediation pathway explains approximately 11.6% of the total impact. This shows that analyst attention played a partial intermediary role between the two variables. Specifically, digital transformation enhances information transparency, provides analysts with richer interpretation materials, can deeply explore the ESG value behind the enterprise digital strategy, and pass positive expectations to the market through the research report, so as to motivate enterprises to upgrade ESG practices.

As for the media, after adding the intermediary variable media attention, its inclusion as a mediator produces a direct effect of 0.0427 and an indirect effect of 0.0093, with a 95% CI [0.007, 0.011] excluding zero—evidence of significant mediation. 15.90% of the total effect is shown as an indirect effect. This shows that media attention played a partial intermediary role. Specifically, the digitalization has improved the transparency of enterprise information, enhanced the media attention, and prompted enterprises to improve ESG performance through external supervision pressure. To sum up, H2 and H3 are both verified.

5. Discussion

Drawing upon the previous theoretical framework and research design, this chapter empirically tests how corporate digitalization influences ESG outcomes through various transmission channels. Benchmark regression and mediation effect test results show that digital transformation significantly improves the performance of enterprise ESG, and media attention and analyst attention play a mediation effect between the two, assuming that H1, H2, and H3 are all true.

However, there are still differences between the two types of mediation effects. The indirect effect of media attention (0.0093) is higher than that of analysts' attention (0.0068), and the proportion of media attention in the total effect is also higher (15.90% vs 11.60%). Media attention is more prominent in the transmission. This may be because the media, as an important external supervision force, can more directly affect the corporate reputation and social image through extensive information dissemination and public opinion pressure, so as to more effectively urge enterprises to pay attention to and improve ESG performance.

This study provides practical suggestions for enterprise managers. While promoting digitalization, more attention needs to be paid to enhancing the transparency and interpretability of information disclosure, so as to fully leverage the external supervision mechanism in strengthening ESG performance. Specifically, enterprises can enhance information transparency through digital technology, attract more multimedia attention and analyst tracking, and more effectively promote the improvement of their ESG practice level with the help of external supervision pressure and a professional interpretation mechanism [8]. This discovery provides clear management guidance for enterprises to optimize resource allocation and orderly promote digital transformation in the process of digital construction.

This study further confirms the positive relationship between digitalization and sustainable development. As Brenner and Hartl pointed out in their multi-method research [9], in accelerating sustainable development, digitalization is regarded as a crucial catalyst, especially in the ecological and economic dimensions. The empirical results of this paper also show that digitalization has greatly improved the performance of enterprise ESG. Media attention and analysts' attention work as an intermediary role, which further reveals the internal path of digital indirectly promoting the sustainable development of enterprises by enhancing information transmission and the external supervision mechanism.

Although digitalization's facilitative influence on ESG outcomes has been widely recognized, the existing research still has some limitations. First, the empirical research on the integration of digital transformation and ESG is relatively scattered and lacks a systematic theoretical framework [10]. Secondly, most of the existing studies focus on developed economies, and the discussion on the relationship between the two in the context of emerging markets is still insufficient. Finally, due to the availability of data and the research cycle, this paper failed to track and analyze the dynamic evolution process of the mediation effect. In future research, longer time-series panel data can be used to investigate the dynamic evolution in transmission mechanisms over time.

6. Conclusion

Drawing upon Chinese A-share firms spanning 2017 through 2023, this investigation examines how digitalization influences corporate ESG outcomes, focusing on the mediating role of media attention and analysts' attention. Findings reveal that digitalization has significantly enhanced the ESG performance of enterprises, and the media attention and analysts' attention both play a part in the mediating effect. The research reveals that digital transformation promotes ESG performance through internal governance optimization, but also forms an effective external supervision and reputation transmission mechanism by improving information transparency and attracting external market attention.

At the theoretical level, this study introduces the external governance mechanism into the analysis framework. It makes up for the lack of existing research focusing too much on the internal path. At the practical level, it provides an operable path enabling firms to elevate ESG practices via digitalization.

However, this study still has some limitations. It is limited by the data; the dynamic evolution of the mediation mechanism has not been tracked for a long time. The sample is concentrated in China's A-share market, and the universality of the conclusion needs to be verified. Looking ahead, with the deep integration of digital technology and sustainable development, the enabling effect of digital transformation on ESG will continue to increase. Follow-up research can use transnational panel data to explore the heterogeneity of the institutional environment, build a comprehensive theoretical model covering internal and external mechanisms, and pay attention to the deepening application of AI, blockchain, and other technologies in ESG information disclosure.

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