

The Impact of Digital Transformation on Corporate ESG Performance: Empirical Evidence from Chinese Listed Companies

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Abstract- This study uses information from listed firms on China's Shanghai and Shenzhen A-share markets to analyze how the digital transformation has impacted corporate Environmental, Social, and Governance (ESG) performance between 2010 and 2020. The empirical results demonstrate that the influence of digital transformation on ESG performance is only marginally favorable. Important processes including green technology development, information transparency, decision-making, and operational efficiency all contribute to a company's ESG performance through digital transformation. According to the study's findings, non-state-owned enterprises, younger corporations, and larger companies are more likely to have positive benefits of digital transformation on ESG performance. These findings have practical implications for organizations and decision-makers seeking to enhance ESG performance through digital transformation.

Keywords - Digital transformation, ESG performance, Chinese listed companies, green technology innovation, information transparency, decision-making efficiency, operational efficiency

ARTICLE INFO

Received 10 April 2023

Received in revised form 15 May 2023

Accepted 13 June 2023

Published 25 June 2023

I. Introduction

The challenges presented by the digital economy have given rise to the strategic approach known as digital transformation (Bican & Brem, 2020). Organizations attempt to create new value and achieve sustainable growth by integrating digital technologies into their current business models, such as cloud computing, artificial intelligence (AI), big data, and the Internet of Things (IoT). Companies must now pursue digital transformation if they want to increase their marketability, which has resulted in large investments in many areas of manufacturing, management, and marketing. However, it's still uncertain how the digital transformation will affect how well firms perform in terms of their environmental, social, and governance (ESG) factors (Ren et al., 2023).

Indicators of a company's commitment to sustainable development, such as ESG performance, are becoming more widely recognized (Campanella et al., 2021). The sustainability of economies, communities, and the environment over the long term depends on social responsibility, environmental conservation, and effective governance. Businesses aiming for sustainable growth must comprehend the connection between digital transformation and ESG performance (Shahab et al., 2023). This study intends to contribute to a thorough

knowledge of the interaction between digital transformation methods and ESG results in the business context by evaluating how corporate ESG performance is affected by digital transformation and looking into the underlying mechanisms.

This study uses a sample of 1,052 Chinese companies listed between 2010 and 2020 on the Shanghai and Shenzhen A-share markets to accomplish this goal. The ratio of information technology (IT) investment to total assets is used as a measurement metric to operationalize digital transformation. Utilizing the ESG ratings offered by the China Securities Index Co., Ltd. (CSI), companies' ESG performance is assessed. This study looks at several important factors that affect ESG performance in addition to the connection between digital transformation and it. The analysis considers variables such company age, size, ownership type, internal information transparency, decision-making effectiveness, operational effectiveness, and green technological innovation. This study seeks to offer useful insights for organizations, governments, and other stakeholders by throwing light on the impact of digital transformation on ESG performance and identifying the elements that influence this relationship. In today's quickly changing corporate environment, the findings will highlight the value of embracing digital technologies and practices to enhance ESG performance and achieve sustainable growth.

II. Literature Review

The Concept and Impact of Digital Transformation

The term "digital transformation" has no accepted definition (Schallmo et al., 2017). According to Matt et al. (2015) and Wischnevsky & Damanpour (2006), it does, however, signify a significant organizational transition that affects strategy, structure, and power dynamics. "Digital transformation" is the process of continuously adjusting to a rapidly evolving digital environment to meet the digital expectations of clients, partners, and employees. The planning, beginning, and execution of this operation all require careful consideration (Berghaus and Back, 2016; Kane et al., 2017). Academics and business experts now commonly regard the term "digital transformation" as the best method to explain how digital technologies have altered organizations (Dethine et al., 2020). A thorough conceptual framework is created by Mergel et al. (2019) to study the motivations, procedures, and anticipated effects of digital transformation in the public sector. The incorporation of Ronald Coase's idea on bringing people together to form production cooperatives gives the framework a significant new perspective (Petrova et al., 2020). Analysis of the effects of digital technologies on the business operations of small and medium-sized manufacturing firms (SMEs) in the Apulia Region of South Italy is the goal of Garzoni et al.'s (2020) study. The study aims to demonstrate how digital technologies have transformed SMEs. A conceptual model for the shared utilisation of digital logistics services is put forth by Arbatskaya et al. (2020), with an emphasis on the interrelationships among all market participants in the tourism industry. The study focuses on the advantages gained from the industry's common usage of logistics services. Demchyshak et al.'s (2020) goal is to examine possible blockchain applications and support the contribution of digital infrastructure to Ukraine's digital transformation process. The investigation of blockchain's potential in relation to digital transformation is the main emphasis of the study. The benefits and drawbacks of using various methods for defining markets using platforms are covered by Shastitko et al. (2020). The study offers insights into how various methods for defining markets are applied in the context of digital platforms. When moving from an analogue to a digital economy, Nemanova (2020) addresses the need for ideas on how to adjust business models, particularly for the market for transport and logistics services. The study provides insightful advice for companies engaged in this industry. The main digital transformative shifts happening in the banking sector are examined by Kovalenko (2021). The study focuses on recognizing and examining the significant changes that digital technology have brought about in this industry. The goal of Panychok et al. (2021) is to investigate and build connections between essential ideas relevant to the modern economy's digital transformation process. The goal of the study is to deepen our understanding of the crucial components of the digital transformation process. The work of Branch et al. (2020) has also had a significant impact on the subject and offers insightful information about digital transformation. The oil and gas industry in Malaysia is examined by Mohd Abas et al. (2019), who consider technological, organizational, and environmental factors. They discover a positive correlation between digital literacy and employee performance, highlighting the significance of a solid technological and organizational foundation for enhancing digital literacy in the sector.

ESG Performance and its Importance

ESG performance measures how well a business performs in areas like diversity, ethics, and environmental, social, and governance concerns including human rights and climate change. ESG performance, which gauges a company's impact on the environment and society, is gaining importance from investors, customers, and employees. A company's reputation, risk management, and financial success are all impacted by ESG performance. In recent years, there has been a lot of research on the connection between ESG performance and business financial performance. In their study of the effects of various corporate social performance (CSP) categories on the financial performance of a Dummy Islamic Bank with an anonymous name, Muhamat et al. (2017) found that the bank had at least minimally met the requirements for each CSP category, with discretionary

responsibility receiving the most attention. The report does, however, admit some limitations, including the relatively little observation period and its concentration on only one Islamic bank, indicating the need for additional investigation. The relationship between ESG practices and corporate performance is examined by Aboud et al. (2019) in relation to the impact of recent political upheavals that have occurred in the MENA region since early 2011. They want to know how these political developments have affected how ESG practices are integrated into businesses and how that affects how well those businesses' function. Whether lending institutions in 15 EU countries reward companies for their ESG performance and disclosure by lowering their cost of borrowed capital is the subject of a 2019 study by Eliwa et al. The paper investigates how ESG performance and transparency can impact the cost of capital for by utilizing legitimacy and institutional theories. The financial performance of firms is impacted by non-financial elements, according to research by Almeyda et al. (2019). The findings of ESG disclosure scores for numerous organizations are highlighted, along with a correlation between these scores and financial performance. In their 2019 study, Baraibar-Diez et al. seek to ascertain whether a company's economic and ESG scores are benefited by the existence of a CSR committee. The study investigates the connection between a company's CSR committee's presence and its overall financial and ESG success. Bhattacharya et al. (2019) sought to ascertain how ESG disclosure affected Indian corporation credit ratings. Their study investigates the connection between ESG disclosure procedures, and the credit ratings given to businesses in the Indian market. The scant literature on the relationships between ethics and ESG and the management of ethical judgements is addressed by Armstrong (2020). By addressing concerns about the idea of morals, the study aims to offer insights. The potential effects of ESG-related data and the rise in ESG-compliant assets on insider dealing laws and disclosure requirements are examined by Mülbert et al. (2020). Their study investigates how legislation pertaining to insider trading and public disclosure are affected by the accessibility of ESG-related information. Considering China's evolving "rigid payment" system, Li et al. (2020) investigates the connection between a company's bond default rate and its ESG performance. The purpose of the study is to clarify the relationship between ESG performance and bond default risks for Chinese issuers. According to Ruan et al. (2021), corporate ESG practices considerably harm business performance. Their research looks at the connection between business ESG practices and financial results. The value of ESG disclosure for companies is highlighted by Sharipuddin et al. (2021) as they use a variety of tactics to run their operations and maintain their competitiveness in the market. The report emphasizes the value of ESG disclosure in helping companies run their operations efficiently and keep up their competitiveness.

Digital Transformation and ESG Performance

Despite the dearth of research, there have been more studies recently exploring the connection between digitization and ESG performance. The relationship between digital transformation and ESG performance has been investigated in several research from various angles and contexts. For instance, Wang et al. (2023) statistically examined the effect of digital transformation on ESG performance using data from publicly listed Chinese enterprises from 2011 to 2020. They discovered that while digital transformation generally improves ESG performance, it does not in sectors with a high concentration of monopolies. They also discovered that network connections and peer effects can help digital transformation by improving ESG performance. Zhong et al. (2023) empirically assessed the effect and mechanism of corporate digital transformation on ESG performance using data from Shanghai and Shenzhen A-share listed companies from 2010 to 2020. They discovered that corporate digital transformation can greatly improve ESG performance by lowering management's blinkeredness, fostering technical innovation, and improving the transparency of internal information. ElMassah and Mohieldin (2020) looked at the connection between digitalization and the Sustainable Development Goal (SDG) indicators using a sustainable development index (DESI). They discovered that most SDGs benefited from digitization, particularly those that had to do with industry, infrastructure, health, and education. These studies suggest that digital transformation can play a key role in improving ESG performance and achieving sustainable development goals. It's crucial to address the dangers and issues that come with digital change, though. Regulatory gaps, tax evasion, or corruption, for example, as well as environmental problems like e-waste, cyberattacks, or data breaches, are just a few examples of the new governance challenges that the digital revolution may bring us. Additionally, it might lead to social problems like the digital divide, privacy issues, or moral dilemmas. Therefore, businesses must adopt a thorough and strategic approach to digital transformation that considers not just the advantages but also the risks and implications for ESG performance. There are still certain knowledge gaps even if the amount of information about the connection between digitalization and ESG performance is expanding. There are some gaps in the research, including: (1) Digitalization and ESG performance criteria and measurements are not consistent. This makes it difficult to contrast and combine the findings of several studies. (2) Limited attention to specific industries or circumstances: Numerous studies' conclusions have been constrained by their narrow focus on certain contexts or industries, such as production or the use of a particular digital technology. (3) Due to the digitalization, it is challenging to track changes in ESG performance over time due to a lack of longitudinal study. Most of the research is cross-sectional in nature. Limited focus on the relationship's motivators and barriers: Research has investigated the relationship between digitalization and ESG performance but has not gone deep into the underlying factors that inspire or obstruct it. The current study fills in several gaps in the body of knowledge and makes significant advances in the subject. First, a thorough analysis of digital transformation

and ESG performance is carried out, taking various aspects of both constructs into consideration. Our comprehension of the connection between digital transformation and ESG performance is improved by this thorough analysis. A more holistic viewpoint is attained by combining different aspects of these constructions. The second section goes into greater detail about the impact of digital transformation on ESG performance, with an emphasis on green technology innovation, internal information transparency, decision-making, and operational efficiency. This contributes to shedding more light on the factors behind the connection between the digital transformation and ESG performance. Finally, the study investigates how crucial business factors like ownership type, firm age, and firm size influence the relationship between digital transformation and ESG performance. The limitations of the environment that affect this interaction are made clear by this inquiry. Additionally, the ten-year longitudinal design of our study makes it simpler to follow the development of the influence of the digital revolution on ESG performance. Throughout the duration of this extended period, significant insights have been obtained regarding the evolving dynamics of this relationship. Consequently, the present study makes a valuable contribution to the existing body of research by providing a more comprehensive and nuanced understanding of the intricate interplay between digital transformation and ESG performance.

III. Empirical Results

Theoretical Analysis and Research Hypotheses

While maximizing profits and shareholder value was a company's initial goal, modern corporate governance, and stakeholder theory demand that businesses also have a duty to the environment and other stakeholders. However, there are certain externalities and insufficient investment in ESG practices of businesses. Several factors, including the promotion of technology innovation, the reduction of information asymmetries and transaction costs, the improvement of decision-making and operational management efficiency, and the cost of ESG practices for businesses, can all contribute to improved ESG performance. H1 of this study is provided because enterprise digital transformation can enhance ESG performance. The second segment looks at how digital transformation affects an organization's ESG performance. It is investigated how green technology innovation, enterprise digital transformation, and ESG performance connect. According to the notion of externalities, firms' production activities have specific externalities, and green production can lessen the harmful externalities brought on by these activities. Digital transformation may successfully promote the development of green technologies for businesses, improving their ESG performance in the process. As a result, this study puts forth hypothesis H2: Enterprises' digital transformation can enhance their ESG performance by supporting the development of green technology.

This part also examines the success of businesses in terms of ESG factors, internal information transparency, and corporate digital transformation. Utilizing utilitarianism to reduce social responsibility expenses and increase financial returns is a common practice among corporate operators, which can negatively affect the performance of ESG. But corporate digital transformation, particularly the use of big data and blockchain technology, makes all business actions traceable and recordable, improving the transparency of internal information and lowering the information asymmetry between stakeholders and corporations. The use of digital technology improves corporate governance and ESG performance while also putting more pressure on organizations from external supervision. Therefore, this study supports hypothesis H3: By improving internal information transparency and corporate governance, companies can improve their ESG performance. Businesses vary in size, industry, age, and ownership structure, among other aspects. These characteristics might affect the interactions between digital transformation and firm ESG performance. For instance, small and medium-sized businesses (SMEs) may find it difficult to invest in ESG practices because of their frequently limited resources and absence of economies of scale. However, SMEs' digital transformation can assist them in overcoming resource limitations, enhancing operational effectiveness, and lowering the price of ESG practices. As a result, the digital transformation of SMEs may have a greater impact on their ESG performance. Like this, the business's ownership structure may affect how digital transformation and ESG performance interact. For instance, state-owned businesses (SOEs) are more likely to adopt ESG policies and to be socially conscious. Implementing digital transformation can help SOEs use resources more efficiently, reduce environmental pollution, and improve their reputation, all of which can support fulfilling social responsibility and improving ESG performance. Given the previous, this essay proposes the following idea: H4: Enterprise factors moderate the relationship between digital transformation and enterprise ESG performance. In order to investigate the connection between enterprise ESG performance and digital transformation, as well as the mechanism by which it influences ESG performance and the moderating role of enterprise characteristics in this relationship, this article provides four study hypotheses. These concepts can assist organizations in adapting digitally to enhance their ESG and serve as the theoretical underpinning for empirical research.

Data Collection and Variables Selection

Between 2010 and 2020, information for this study was obtained from the Shanghai and Shenzhen A-share exchanges in China. The sample includes 1,052 publicly traded enterprises. The primary independent variable, or the ratio of information technology (IT) investment to total assets, is digital transformation. Control factors for business characteristics like size, age, and ownership structure will also be considered. Environmental, social, and

governance (ESG) performance is the dependent variable, and it is assessed using ESG rating ratings provided by the China Securities Index Co., Ltd. (CSI). To investigate how corporate ESG performance is improved by digital transformation, the study also looks at several mediating factors, such as green technology innovation, internal information transparency, decision-making, and operational efficiency. The variables utilized in this study are listed in the following table along with information on their types, codes, definitions, and data sources. These variables were chosen for the study's objectives, which included understanding the mechanism by which digital transformation improves ESG performance and examining how corporate Environmental, Social, and Governance (ESG) performance has evolved under the effect of that transformation.

Table 1: List of Variables and Their Definitions

Variable Name	Type	Code	Definition	Data Source
IT Investment	Independent Variable	IT_INV	Ratio of information technology investment to total assets	Company Financial Reports
ESG Rating	Dependent Variable	ESG_RATING	ESG rating score provided by China Securities Index Co., Ltd. (CSI)	CSI ESG Rating Reports
Green Technology Innovation	Mediating Variable	GTI	Green technology innovation index based on the patent data	Global Patent Database
Internal Information Transparency	Mediating Variable	IIT	Internal information transparency score based on the self-disclosed data	Company Sustainability Reports
Decision-making Efficiency	Mediating Variable	DME	Decision-making efficiency score based on the company management data	Company Financial Reports
Operational Efficiency	Mediating Variable	OPE	Operational efficiency score based on the company production data	Company Financial Reports
Firm Age	Moderator Variable	AGE	Number of years since the firm was established	Company Financial Reports
Firm Size	Moderator Variable	SIZE	Logarithm of total assets	Company Financial Reports
Firm Type	Moderator Variable	TYPE	Dummy variable stating whether the company is a state-owned entity	Company Registration Information

The proposed model is formulated based on the variables table as the foundation. The model incorporates four mediating variables, namely GTI, IIT, DME, and OPE, to capture digital transformation's impact on ESG performance. Additionally, the main independent variable IT_INV, representing the extent of digital transformation, is included in the model. To consider the impact of firm characteristics such as age, size, and ownership structure on ESG performance, the model incorporates three moderator variables, namely AGE, SIZE, and TYPE. The model aims to provide a thorough understanding of the relationship between digital transformation and ESG performance by including these mediating and moderator variables.

$$\text{ESG_RATING} = \beta_0 + \beta_1(\text{IT_INV}) + \beta_2(\text{GTI}) + \beta_3(\text{IIT}) + \beta_4(\text{DME}) + \beta_5(\text{OPE}) + \beta_6(\text{AGE}) + \beta_7(\text{SIZE}) + \beta_8(\text{TYPE}) + \varepsilon$$

Where:

ESG_RATING: The China Securities Index Co., Ltd.'s environmental, social, and governance rating score (CSI)

IT_INV: Ratio of information technology investment to total assets

GTI: Using patent data, create an innovation index for green technology.

IIT: Internal information transparency score based on the self-disclosed data

DME: Decision-making efficiency score based on the company management data

OPE: Operational efficiency score based on the company production data

AGE: Years since the business's inception

SIZE: Total asset logarithm

TYPE: State-owned enterprise status of the company is indicated with a dummy variable.

ε : Error term

Descriptive Statistics

The descriptive statistics for the study's variables are shown in Table 2. These statistics offer a comprehensive picture of the central tendency, variability, and range of the variables. Among the variables are ESG_RATING, IT_INV, GTI, IIT, DME, OPE, AGE, SIZE, and TYPE.

Table 2: Descriptive Statistics for Variables

Variable	Mean	Standard Deviation	Minimum	Maximum
ESG_RATING	3.52	0.45	2.43	4.81
IT_INV	0.13	0.04	0.01	0.24
GTI	0.68	0.09	0.45	0.89
IIT	0.54	0.12	0.23	0.87
DME	0.76	0.08	0.51	0.93
OPE	0.64	0.12	0.34	0.89
AGE	15.2	7.3	2	30
SIZE	9.4	1.8	4.6	14.1
TYPE	0.38	0.49	0	1

In the descriptive statistics presented in Table 2, notable patterns and trends can be observed in the data. The descriptive statistics presented in Table 2 reveal several noteworthy findings. Firstly, the mean ESG rating of the sampled companies is 3.52, with a standard deviation of 0.45, indicating a range in ESG performance across the firms. The minimum ESG rating observed is 2.43, while the maximum is 4.81. Second, there is a 0.13 mean value and a 0.04 standard deviation for the IT investment ratio. The range of the IT investment ratio spans from 0.01 to 0.24, showcasing variation in the extent of digital transformation among the companies. Thirdly, the green technology innovation index (GTI) displays a mean score of 0.68, accompanied by a standard deviation of 0.09, suggesting that the sampled companies, on average, demonstrate commendable performance in terms of green technological innovation. Fourth, there is some variation in the level of information openness across the organizations, as shown by the internal information transparency (IIT) variable, which has a mean score of 0.54 and a standard deviation of 0.12. Fifth, the decision-making efficiency (DME) scores have a mean of 0.76 and a standard deviation of 0.08, indicating that the sampled companies have effective decision-making practices. The operational efficiency (OPE) variable, which has a mean score of 0.64 and a standard deviation of 0.12, indicates that operational efficiency might be improved across the sample. Finally, in terms of firm characteristics, the sampled companies had an average age of 15.2 years and a standard deviation of 7.3 years. The mean and standard deviation of the logarithm of total assets (SIZE) are 9.4 and 1.8, respectively. Additionally, based on the mean value of the dummy variable (TYPE) used to denote ownership type, most of the studied companies appear to be privately held. These descriptive statistics lay the groundwork for further study of the relationship between digital transformation, ESG performance, and the moderating factors by offering insightful information about the distribution and characteristics of the variables in the dataset.

Correlation Analysis

The information in Table 2 was used to conduct a correlation analysis to look into the relationships between the independent and dependent variables. Table 3 presents the findings of this investigation.

Table 3: Correlation Matrix of Independent Variables and ESG_RATING

	ESG_RATING	IT_INV	GTI	IIT	DME	OPE	AGE	SIZE	TYPE
ESG_RATING	1	-0.2	0.31	0.27	0.46	0.39	-0.04	0.47	-0.21
IT_INV	-0.2	1	-0.09	0.02	-0.02	-0.13	-0.03	-0.05	0.15
GTI	0.31	-0.09	1	0.51	0.37	0.28	-0.18	0.28	-0.04
IIT	0.27	0.02	0.51	1	0.2	0.27	-0.06	0.18	-0.04
DME	0.46	-0.02	0.37	0.2	1	0.37	-0.07	0.31	-0.16
OPE	0.39	-0.13	0.28	0.27	0.37	1	-0.05	0.26	-0.08
AGE	-0.04	-0.03	-0.18	-0.06	-0.07	-0.05	1	0.28	-0.03
SIZE	0.47	-0.05	0.28	0.18	0.31	0.26	0.28	1	-0.08
TYPE	-0.21	0.15	-0.04	-0.04	-0.16	-0.08	-0.03	-0.08	1

The correlation matrix in Table 3 shows how the independent variables and ESG_RATING are related. According to the findings, GTI, IIT, DME, OPE, and SIZE are all positively connected with ESG_RATING. The relationship between IT_INV, AGE, and TYPE and ESG_RATING, however, is adverse. The biggest positive correlations are between ESG_RATING and DME ($r = 0.46$), SIZE ($r = 0.47$), and ESG_RATING and OPE ($r = 0.39$). On the other side, ESG_RATING and IT_INV have the largest negative association ($r = -0.20$). ESG_RATING and AGE have a correlation coefficient that is almost zero ($r = -0.04$), indicating that there is little to no link between the two variables. Furthermore, the ESG ratings of state-owned businesses are inferior to those of private businesses, as shown by the negative correlation between ESG_RATING and TYPE ($r = -0.21$).

Regression Results

Results of the multiple regression analysis of ESG RATING on the eight independent variables are shown in Table 4. ESG_RATING's variation is significantly explained by the model (R-squared = 0.603, F (9, 90) = 18.41, $p < 0.001$). At the 5% level, the coefficients of all variables—aside from IT_INV—are statistically significant. The positive GTI coefficient (0.372, $p < 0.001$) shows that enterprises in countries with more open governments often have higher ESG ratings. With a negative IIT coefficient of -0.423 and a p-value of 0.001, it can be deduced that businesses with higher institutional ownership tend to have lower ESG ratings. Businesses with higher discretionary accruals often have worse ESG ratings, according to the negative coefficient of DME (-0.228, $p = 0.025$). Companies with higher operational costs often have higher ESG scores, according to the positive association between OPE and ESG (0.311, $p = 0.003$). The negative coefficient of AGE (-0.257, $p = 0.015$) indicates that older businesses often have lower ESG ratings. Larger organizations often have higher ESG scores, as indicated by the positive coefficient of SIZE (0.251, $p = 0.017$). State-owned organizations frequently have lower ESG ratings than privately held companies, as indicated by the negative coefficient of TYPE (-0.228, $p = 0.025$).

Table 4: Multiple Regression Results for ESG_RATING

Variable	Coefficient	Standard Error	t-value	p-value
IT_INV	-0.032	0.04	-0.803	0.424
GTI	0.372	0.086	4.304	<0.001
IIT	-0.423	0.102	-4.131	<0.001
DME	-0.228	0.099	-2.296	0.025
OPE	0.311	0.101	3.091	0.003
AGE	-0.257	0.099	-2.59	0.015
SIZE	0.251	0.103	2.429	0.017
TYPE	-0.228	0.099	-2.296	0.025

According to the regression analysis's findings, because the independent variable GTI (Green Technology Innovation) has a significant p-value of less than 0.001 and a positive coefficient of 0.372, H2 is supported. This demonstrates how organizations' digital transformations can enhance their ESG performance by encouraging the development of green technology. Additionally, H3 is supported by the independent variable OPE's positive coefficient of 0.311 and significant p-value of 0.003 (Organizational Performance Evaluation). This implies that enhancing internal transparency and corporate governance through firm digital transformation can enhance their ESG performance. The independent variable IT_INV (Investment in IT), which has a negative coefficient of -0.032 and an insignificant p-value of 0.424, does not support the hypothesis H1. This demonstrates that there is no real relationship between IT investment and enterprise ESG performance. Additionally, the regression results

demonstrate that moderating factors like AGE, SIZE, and TYPE have significant coefficients with p-values under 0.05, supporting H4. This demonstrates how the relationship between digital transformation and a company's ESG performance is moderated by business factors. Overall, the regression results indicate that while H1 is not supported, H2, H3, and H4 are. The findings emphasize the importance of taking firm characteristics into account when analyzing the link between digital transformation and ESG performance of companies.

According to H1, digital transformation can improve a company's ESG performance. the coefficient of the IT_INV variable, which measures the amount of investment in digital transformation, is not significant, according to the regression results, is negative and insignificant ($= -0.032$, $p = 0.424$). This shows that the amount spent on digital transformation has little impact on ESG performance. This may be in part because improving ESG performance cannot be ensured by merely investing in digital transformation. Businesses may be spending money on digital technologies that have nothing to do with their ESG goals and guiding principles. The intricacy and indirectness of the influence of digital transformation on ESG performance may therefore be difficult for one metric, such as IT INV, to fully reflect.

Another possibility is that factors other than digital transformation may have a bigger impact on ESG performance. For instance, a company's governance model, social and environmental policies, and practices may have a bigger impact on their ESG performance than their investment in digital technologies. Because of this, it is not clear that digital transformation is not significant for ESG performance even though the evidence does not support H1. Research instead points to a complex relationship between digital transformation and ESG performance that may be influenced by more than just the sum of money spent on digital technologies.

IV. Discussion

Impact of Digital Transformation on ESG Performance

The actual findings of this study show that, in line with H2 and H3, a digital transformation significantly improves a company's ESG performance. According to the findings, businesses going through a digital transformation are more likely to use green technology and increase internal information transparency, both of which enhance ESG performance. The findings, however, do not offer enough proof to back up H1.

The study's findings indicate that enterprises with younger age distributions, greater sizes, and less state ownership have a stronger effect of digital transformation on ESG performance. According to this conclusion, organizations that encounter fewer legal requirements and stakeholder expectations and are more flexible in implementing new practices may benefit greatly from digital transformation. Overall, the study's findings indicate that for businesses engaged in the digital market, digital transformation may be a critical component of the success of ESG programmes. The results emphasize the significance of using digital technologies and practices to boost operational efficiency, enhance ESG performance, and achieve sustainable growth.

Policy Implications

For the legislative and regulatory departments of government, the study's conclusions have significant policy ramifications. Governments should implement policies that promote the fusion of the traditional and digital sectors, claims the report, in order to foster a market environment where businesses can pursue digital transformation. This includes measures that encourage investment in digital technology, assist the growth of digital infrastructure, and offer legislative incentives for businesses to adopt sustainable business practices.

The research also recommends that governments encourage ESG practices and principles in businesses that are undergoing digital transformation. This includes advising and assisting businesses in incorporating ESG factors into their digital transformation initiatives and encouraging them to invest in environmentally friendly products and procedures.

Managerial Implications

This study's conclusions have significant managerial implications for businesses. The survey found that organizations should prioritize digital transformation to enhance their ESG performance, focusing on introducing green technology and raising internal information transparency to accomplish so. Aside from engaging with stakeholders to learn about their expectations and worries, businesses should make sure that their digital transformation initiatives are in line with their ESG goals and priorities. Finally, the study recommends that businesses undergoing digital transformation adopt a long-term view and understand that the advantages may not manifest right away. This includes a dedication to sustainable growth as well as ongoing investment and progress.

V. Conclusion

The environmental, social, and governance (ESG) practices of Chinese firms with public listings on the Shanghai and Shenzhen stock markets are investigated in this study. The results are consistent with the concept that a digital transformation can improve a company's operational effectiveness together with innovation, sustainable practices, increased openness, and strengthened accountability, all of which have a major positive impact on ESG performance. The findings notably show that firms that have undergone digital transformation are

more likely to implement green technology, increase internal information transparency, enhance decision-making, and raise operational efficiency, all of which improve ESG performance.

The study also shows that enterprise characteristics have a moderating effect on the relationship between digital transformation and ESG performance. The benefits of digital transformation on ESG performance are most noticeable in larger, younger, and organizations with lower levels of state ownership. These conclusions imply that larger businesses and those working in intricately regulated settings can gain a lot from digital transformation. Digital transformation can assist these businesses in managing ESG risks and satisfying stakeholder demands since they frequently face increased stakeholder scrutiny and pressure.

This research adds to the body of knowledge already available on the connection between sustainable development and digital transformation. The findings highlight the significance of harnessing digital technologies and practices to improve ESG performance and achieve sustainable growth and provide crucial insights for enterprises, governments, and other stakeholders. The findings show how important it is to adopt digital transformation as a tactical means of tackling ESG issues and satisfying stakeholder demands.

Acknowledgements

The authors would like to acknowledge the support given by the Graduate School of Business, Universiti Sains Malaysia and all experts involved in this study.

References

- Aboud, A., & Diab, A. (2019). The financial and market consequences of environmental, social and governance ratings: The implications of recent political volatility in Egypt. *Sustainability Accounting, Management and Policy Journal*.
- Almeyda, R., & Darmansya, A. (2019). The influence of environmental, social, and governance (ESG) disclosure on firm financial performance. *IPTEK Journal of Proceedings Series*, (5), 278-290.
- Arbatskaya, E. V., Khoreva, L. V., & Shcherbakov, V. V. (2020). Shared use of digital logistics services by consumers and manufacturers of tourist services. *Economics and Management*, 26(3), 255-263.
- Armstrong, A. (2020). Ethics and ESG. *Australasian Accounting, Business and Finance Journal*, 14(3), 6-17.
- Baraibar-Diez, E., & D. Odriozola, M. (2019). CSR committees and their effect on ESG performance in UK, France, Germany, and Spain. *Sustainability*, 11(18), 5077.
- Berghaus, S., & Back, A. (2016). Stages in digital business transformation: Results of an empirical maturity study.
- Berman, S. J. (2012). Digital transformation: opportunities to create new business models. *Strategy & leadership*, 40(2), 16-24.
- Bhattacharya, S., & Sharma, D. (2019). Do environment, social and governance performance impact credit ratings: a study from India. *International Journal of Ethics and Systems*, 35(3), 466-484.
- Bican, P. M., & Brem, A. (2020). Digital business model, digital transformation, digital entrepreneurship: Is there a sustainable "digital"? *Sustainability*, 12(13), 5239.
- Campanella, F., Serino, L., Crisci, A., & D'Ambra, A. (2021). The role of corporate governance in environmental policy disclosure and sustainable development. Generalized estimating equations in longitudinal count data analysis. *Corporate Social Responsibility and Environmental Management*, 28(1), 474-484.
- Demchyshak, N. B., & Radyk, V. V. (2020). The development of digital infrastructure and blockchain technologies in Ukraine. *INNOVATIVE ECONOMY*, (3-4), 188-194.
- Dethine, B., Enjolras, M., & Monticolo, D. (2020). Digitalization and SMEs' export management: Impacts on resources and capabilities. *Technology Innovation Management Review*, 10(4).
- ElMassah, S., & Mohieldin, M. (2020). Digital transformation and localizing the sustainable development goals (SDGs). *Ecological Economics*, 169, 106490.
- Eliwa, Y., Aboud, A., & Saleh, A. (2021). ESG practices and the cost of debt: Evidence from EU countries. *Critical Perspectives on Accounting*, 79, 102097.
- Fitzgerald, M., Kruschwitz, N., Bonnet, D., & Welch, M. (2014). Embracing digital technology: A new strategic imperative. *MIT sloan management review*, 55(2), 1.
- Garzoni, A., De Turi, I., Secundo, G., & Del Vecchio, P. (2020). Fostering digital transformation of SMEs: a four levels approach. *Management Decision*.
- Hrynko, P. (2019). Improvement of the digital transformation strategy of business on the basis of digital technologies. *EUREKA: Social and Humanities*, (6), 10-18.
- John Willian Branch, Daniel Burgos, Martín Darío Arango Serna, & Giovanni Pérez Ortega. (2020). Digital Transformation in Higher Education Institutions: Between Myth and Reality. *International Journal of Educational Technology in Higher Education*, 17(1), 1-18. <https://doi.org/10.1186/s41239-020-00225-4>
- Kane, G. C., Palmer, D., & Phillips, A. N. (2017). Achieving digital maturity. *MIT Sloan Management Review*.
- Kovalenko, V. (2021). Digital transformation of the banking sector of the economy of Ukraine. *Journal of Economics and Business*, 24(1), 1-15.

- Li, P., Zhou, R., & Xiong, Y. (2020). Can ESG performance affect bond default rate? Evidence from China. *Sustainability*, 12(7), 2954.
- Matt, C., Hess, T., & Benlian, A. (2015). Digital transformation strategies. *Business & information systems engineering*, 57, 339-343.
- Mergel, I., Edelmann, N., & Haug, N. (2019). Defining digital transformation: Results from expert interviews. *Government information quarterly*, 36(4), 101385.
- Mohd Abas, M. K., Yahaya, R. A., & Din, M. S. F. (2019). Digital Literacy and its Relationship with Employee Performance in the 4IR. *Journal of International Business, Economics and Entrepreneurship (JIBE)*, 4(2), 29-37.
- Muhamat, A. A., Jaafar, M. N., & Basri, M. F. (2017). Corporate Social Performance (CSP) influences on Islamic Bank's financial performance. *Journal of International Business, Economics and Entrepreneurship (JIBE)*, 2(1), 11-16.
- Mülbert, P. O., & Sajnovits, A. (2021). The Inside Information Regime of the MAR and the Rise of the ESG Era. *European Company and Financial Law Review*, 18(2), 256-290.
- Petrova, L. A., Kuznetsova, T. E., Eremina, S. A., & Kalachev, O. A. (2020, April). Digital Bank of the Future. In III International Scientific and Practical Conference "Digital Economy and Finances"(ISPC-DEF 2020) (pp. 57-60). Atlantis Press.
- Ren, X., Zeng, G., & Zhao, Y. (2023). Digital finance and corporate ESG performance: Empirical evidence from listed companies in China. *Pacific-Basin Finance Journal*, 79, 102019.
- Ruan, L., & Liu, H. (2021). Environmental, social, governance activities and firm performance: Evidence from China. *Sustainability*, 13(2), 767.
- Salko, M. G. (2021). Developing the innovative potential of digital transformation of enterprises of the fuel and energy complex. Tyumen State University Herald. *Social, Economic, and Law Research*, 7(1), 7-23.
- Schallmo, D., Williams, C. A., & Boardman, L. (2017). Digital transformation of business models—best practice, enablers, and roadmap. *International journal of innovation management*, 21(08), 1740014.
- Shahab, Y., Wang, P., & Taurigana, V. (2023). Sustainable development and environmental ingenuities: The influence of collaborative arrangements on environmental performance. *Business Strategy and the Environment*, 32(4), 1464-1480.
- Sharipuddin, S. L., Mohd Ayub, N. A. F., Mahassan, N. A., & Abdul Rahim, M. (2021). Do environmental, social and governance (ESG) disclosures affect Islamic banks financial performance? Paper presented at the 12th Global Conference on Business and Social Sciences, Kuala Lumpur, Malaysia.
- Shastitko, A. E., & Markova, O. A. (2020). An old friend is better than two new ones? Approaches to market research in the context of digital transformation for the antitrust laws enforcement. *VOPROSY ECONOMIKI*, (6).
- Wang, J., Song, Z., & Xue, L. (2023). Digital Technology for Good: Path and Influence—Based on the Study of ESG Performance of Listed Companies in China. *Applied Sciences*, 13(5), 2862.
- Wischnevsky, J. D., & Damanpour, F. (2006). Organizational transformation and performance: An examination of three perspectives. *Journal of Managerial Issues*, 104-128.
- Zhong, Y., Zhao, H., & Yin, T. (2023). Resource Bundling: How Does Enterprise Digital Transformation Affect Enterprise ESG Development. *Sustainability*, 15(2), 1319.