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Original Article

# Corporate governance and firm performance in Vietnam: The moderating role of digital transformation

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**Abstract:** This study examines the interplay between corporate governance mechanisms and firm performance in the Vietnamese context, with a particular focus on the moderating role of digital transformation. Utilizing a sample of 150 Vietnamese firms in 2023, the study employs a GMM approach to analyze the relationship between board characteristics (size, independence, duality, gender diversity, meeting frequency, and nationality diversity), digital transformation, and firm performance, proxied by ROA, ROE, and EPS. The findings reveal that board size and CEO duality positively influence firm performance. Notably, the positive impact of gender diversity on performance is amplified by digital transformation. While digital transformation exhibits a standalone positive effect on performance, its moderating role on other governance mechanisms is mixed. These results underscore the importance of effective corporate governance practices, particularly in the context of digital transformation, for enhancing firm performance in the Vietnamese market.

*Keywords:* Board of directors' characteristics, corporate governance, listed companies, digital transformation, Vietnam.

## 1. Introduction

Digital transformation is widely recognized as a significant driver of growth and innovation, particularly in developed markets. However, its impact on firm performance in emerging markets, such as Vietnam, remains inconsistent. Recent years have witnessed a surge in digital transformation initiatives in these regions, fueled by rising internet penetration, increased mobile phone usage, and the availability of affordable digital tools. Despite these advancements, the adverse effect of digital transformation on firm performance in emerging markets is noteworthy.

A major challenge is the digital divide, where disparities in access to digital tools and infrastructure, particularly in rural areas, hinder the benefits of digital transformation for firms. Additionally, a skills gap persists in many emerging markets, with a shortage of workers proficient in data analytics, cybersecurity, and

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software development, which limits firms' ability to fully exploit digital transformation. The process can be costly and time-consuming, especially for firms with limited financial resources and experience, leading to high initial costs and disruptions in existing business processes, adversely affecting short-term performance. Furthermore, the rapid pace of technological advancements poses a challenge for firms in emerging markets, as keeping up with the latest developments can be difficult, particularly for smaller firms, risking loss of market share and competitive edge.

This study aims to examine the impact of digital transformation on firm performance, using Return on Assets (ROA), Return on Equity (ROE), and Earnings Per Share (EPS) as key performance metrics. These metrics offer robust measures of company performance, particularly in transitional economies like Vietnam. The study will also explore the moderating role of digital transformation on the relationships between various corporate governance variables and firm performance. By integrating accounting-based measures, the study aims to provide a more accurate reflection of internal business performance amid market volatility.

In addition, the study considers several corporate governance factors that may influence firm performance, such as board size, board independence, CEO duality, gender diversity, and the frequency of board meetings. These variables reflect a blend of management and agency theories and are hypothesized to have significant impacts on corporate performance. The findings from this research are expected to contribute to the understanding of how digital transformation and corporate governance interact to shape firm performance in Vietnam's emerging market.

## 2. Literature review

### *2.1. Theoretical foundations*

Agency theory

Agency theory was described as a contractual relationship where one or more principals (shareholders) engage agents (company executives) to perform certain services on their behalf, including decision-making authority (Jensen & Meckling, 1976). Agency theory focuses on two main issues: First, how to create an incentive and monitoring system to prevent managers from misusing principals' assets, and second, how to ensure an efficient agency system under imperfect conditions (Coriat & Weinstein, 2002). To address these issues, agency theory proposes two mechanisms: The inclusion of independent board members and performance-based compensation for managers. By aligning managers' rewards with company performance, their interests become more aligned with those of the owners (Baker & Anderson, 2012).

Stakeholder theory

Stakeholder theory contrasts with traditional views of corporate governance, which focused primarily on the roles of the board of directors in control and decision-making. According to stakeholder theory, a company operates within a larger social system, and its purpose is to create value for all stakeholders by converting their interests into products and services, thereby increasing their wealth (Clarkson, 1995).Stakeholder theory advocates for increased stakeholder voice and incentives. This broader focus shifts the responsibility of the board from merely serving shareholders to considering the interests of a wider group of stakeholders, addressing social, environmental, and ethical issues (Donaldson & Preston, 1995; Freeman et al., 2004).

### *2.2. Corporate governance variables and firm performance*

The relationship between corporate governance compliance and firm performance in Vietnam hinges on the principle that effective governance enhances managerial oversight, leading to improved decision-making and resource allocation. In Vietnam's dynamic economic environment, where firms face increasing domestic and international competition, strong corporate governance is essential. It aligns managers with shareholders' interests, promoting value-maximizing projects and mitigating the risk of resource misuse (Love, 2011). Moreover, robust governance frameworks are crucial for protecting minority shareholders from exploitation by controlling shareholders, a significant concern in markets with concentrated ownership.

Empirical evidence suggests that firms with better governance structures are less likely to face corporate insolvency, as adherence to governance practices improves access to external funding by increasing investor confidence (Claessens, Djankov, & Klapper, 2003; Fich & Slezak, 2008; Amana & Nguyen, 2013). This is especially pertinent in Vietnam, where the financial markets are still developing, and firms rely heavily on external capital to finance growth. However, it is also important to acknowledge that the relationship between corporate governance and firm performance may not always be straightforward. In some cases, firms might only comply with governance standards to the extent necessary to satisfy regulatory requirements, without these practices having a significant causal impact on performance. This suggests that corporate governance compliance could be endogenously determined, where the level of governance adopted is influenced by firm-specific factors rather than directly impacting firm performance (Love, 2011).

In Vietnam, digital transformation is increasingly recognized as a critical factor in enhancing corporate governance and firm performance. The integration of digital tools into governance processes facilitates better monitoring, data-driven decision-making, and improved transparency, thereby reducing agency costs and boosting investor confidence. While digital transformation enhances governance effectiveness, it also introduces challenges related to cybersecurity and regulatory compliance. As Vietnamese firms embrace digital governance, the moderating role of digital transformation becomes crucial in optimizing governance practices and improving firm performance in a competitive market. These dynamics are consistent with global research, highlighting the dual benefits and risks of digital transformation in corporate governance (Shan & Troshani, 2016; Tokmakov & Kalishenko, 2019).

Dependent variables

Return on assets (ROA): ROA is an indicator for a business to make a profit on some assets owned. This ratio is used to measure the ability of management to make an overall profit. The larger the ROA, the greater the company's profit, and the better the company's position in terms of asset utilization (Brigham & Houston, 2016). ROA can help companies that have implemented good accounting practices measure the efficiency of capital use sensitive to everything that affects a company's financial health and to be able to know the company's position in the industry.

Return on Equity (ROE): ROE serves as a crucial metric for evaluating a company's ability to generate profit from shareholders' equity, reflecting the efficiency of management in delivering returns to investors (Duniarto, 2015). ROE is widely used to gauge firm performance, with higher values indicating better operational efficiency and a stronger likelihood of increasing stock prices (Damayanti, 2016; Chatelia, 2016). ROE is measured by dividing the company's net income by its average equity, providing insights into the effectiveness of shareholder investment management (Tingakt, 2004).

[BW1]Earnings per share (EPS): EPS is calculated by dividing the company's net income by the number of outstanding common shares, enabling investors to compare profitability across companies regardless of their size or share count. Research indicates mixed findings on the relationship between EPS and corporate governance characteristics. For instance, Ahmed (2015) found no significant relationship between EPS and board characteristics in Bahrain, whereas Dănescu et al. (2021) in Bucharest reported a positive association between EPS and CEO duality, and Chen et al. (2006) identified a positive correlation between board size and EPS. Furthermore, Shittu, Ahmad, and Ishak (2016) using OLS regression, observed a significant positive relationship between EPS and board size and meetings, although they also noted a negative relationship between EPS and board size. Contrarily, Deb et al. (2021) did not find a statistically significant relationship between board size and firm performance, while uncovering a negative correlation between audit committee presence and profitability metrics like ROA and ROE. The significance of EPS as a performance indicator lies in its ability to reflect the total income available to common shareholders and to highlight potential profitability when comparing different entities over time.

Independent variables

- Board size, measured by the total number of directors, has mixed findings in the literature. While larger boards may offer valuable contributions and resource connections (Shukeri et al., 2012; Mak & Kusnadi, 2005; Mohapatra, 2017; Pranati, 2017; Chu et al., 2018; Ciftci et al., 2019; Firstenberg & Malkiel, 1994), they can also face difficulties in decision-making and agency problems, negatively impacting firm performance (Jensen, 1993; Lipton & Lorsch, 1992; Yermack, 1996; Eisenberg et al., 1998; Vintilă et al., 2015; Shabbir et al., 2019; Guest, 2008).

- Board independence, defined by the proportion of non-executive directors, plays a critical monitoring role, potentially enhancing firm performance by mitigating managerial abuses (Fama & Jensen, 1983; Dehaene et al., 2001; Krivogorsky, 2006; Andrés & Vallelado, 2008; Farag & Mallin, 2017). However, evidence on the effectiveness of board independence remains inconclusive (Agrawal & Knoeber, 1996; Yermack, 1996; Bhagat & Black, 2002; Wintoki et al., 2012).

- CEO duality, where the CEO also serves as the board chair, is debated between agency theory, which views it as a conflict of interest (Jensen & Meckling, 1976), and stewardship theory, which sees it as a unified leadership structure (Donaldson & Davis, 1991; Muth & Donaldson, 1998). Previous studies show mixed results regarding its impact on firm performance (Cornett et al., 2008; Yang & Zhao, 2014; Shabbir et al., 2019).

- Gender diversity on boards, often mandated by regulations, is associated with enhanced firm performance through diverse perspectives and improved decision-making (Carter et al., 2003; Terjesen et al., 2016; Achkar & Bouri, 2020; Noja et al., 2021). Nonetheless, some studies indicate a threshold beyond which additional diversity might be detrimental (Nguyen et al., 2015; Mohsni et al., 2021).

- The frequency of board meetings, indicative of active governance, is generally seen as positively influencing firm performance through better oversight and strategic adjustments (Puni, 2020; Irshad et al., 2015; Lipton & Lorsch, 1992), though excessive meetings may incur costs without proportionate benefits (Vafeas, 1999).

Control variables

Firm size is an essential control variable in analyzing corporate performance, as larger companies face more significant agency problems and require robust corporate governance. Studies such as Choi et al. (2007) suggest that larger firms need more extensive boards, increasing supervision costs and impacting performance. Larger companies can generate internal capital more easily and access external funding more readily, influencing their operational efficiency. Research indicates that firm size affects market share and should be incorporated in performance analysis (Almashhadani, 2020; Ahmed et al., 2021). Alabdullah (2022) notes that financial leverage differences among firms relate to their size, with varying leverage levels across companies. This study aims to establish the link between financial performance and firm size, helping firms avoid potential adverse consequences (Alabdullah, 2022; Ahmed et al., 2019). Firm size is measured by the natural logarithm of total assets, consistent with prior studies that find a correlation between firm size and performance, where larger firms demand additional management and expertise, leading to larger board sizes (Guest, 2008; Lasfer, 2006; Linck et al., 2008).

Moderate variable

Digital transformation significantly moderates the relationship between corporate governance and firm performance, particularly in emerging markets like Vietnam. Integrating advanced technologies such as data analytics, automation, and AI within governance structures can enhance operational agility, innovation, and competitiveness. However, digital transformation also presents challenges, especially in emerging markets, including the digital divide and skills gap, which hinder access to essential tools and expertise. Additionally, rapid technological change complicates implementation, particularly for smaller firms. Understanding this moderating effect is essential for optimizing governance reforms and maintaining competitive advantage (Ahmed, 2015; Dănescu et al., 2021; Chen et al., 2006).

Hypotheses

*H1: Board size negatively affects firm performance.*

*H2: The proportion of independent board members positively affects firm performance.*

*H3: CEO duality negatively affects firm performance.*

*H4: The proportion of female board members positively affects firm performance.*

*H5: The frequency of annual board meetings positively affects firm performance.*

*H6: The diversity of nationality of board members negatively affects firm performance.*

*H7: Firm size has a significant impact on firm performance.*

*H8: Digital transformation plays a significant role in moderating the relationship among explanatory variables.*

This expanded structure retains the citations and detailed discussion of the literature, ensuring that both sections are comprehensive and well-supported by the theoretical frameworks and previous research.

## 3. Methodology

### *3.1. Data collection*

The study employs an empirical model to analyze the impact of corporate governance on firm performance in the context of digital transformation, using data from 150 Vietnamese listed firms in 2023. The model explores the interaction between digital transformation and various explanatory variables, particularly focusing on whether digital transformation moderates the effects of corporate governance on firm performance. To quantify digital transformation, the study adopts a word frequency approach, analyzing the language used in annual reports of the listed firms. This method is based on the premise that the frequency of specific terms, such as "digital transformation," reflects the strategic emphasis of the firms on this area. By leveraging word frequency statistics, as recommended by previous research (Ahmed et al., 2021), the study effectively captures the strategic orientation and level of digital transformation among Vietnamese firms.

*3.2. Analytical method*

The analysis begins with selecting appropriate keywords that accurately capture the digital transformation activities of firms, starting with an initial seed word. Vietnamese word segmentation is performed using Word Embedding on company annual reports to develop a set of similar words. Words with over 50 percent similarity to the seed word undergo manual review, followed by a correlation analysis to validate the keyword set. The analysis reveals a high correlation among the selected keywords, with terms like "digital transformation" showing statistical significance at the 5% level, confirming the appropriateness of the chosen keywords. Core digital transformation technologies—artificial intelligence, blockchain, cloud computing, and big data—are represented by terms such as "digitalization," "big data," and "information technology," which are manually extracted from the annual reports of 150 Vietnamese firms listed in 2023. The frequency of these terms is aggregated, and the natural logarithm of the total frequency is used as an index to assess the digital transformation performance of the firms. The natural logarithm of total assets (fsize) is employed as a control variable, reflecting its established impact on firm performance as documented in prior studies (Ahmed et al., 2021; Linck et al., 2008).

This study employs the Generalized Method of Moments (GMM) to explore the moderating role of digital transformation on the relationship between corporate governance and firm performance. Given the rapid digitalization in Vietnam, GMM is particularly well-suited to address challenges such as autocorrelation, heteroscedasticity, and endogeneity that often arise in panel data analysis. The GMM technique is advantageous as it minimizes the discrepancy between observed data and model predictions by leveraging moment conditions that align with the data's inherent characteristics. This approach is essential in the Vietnamese market, where the integration of digital transformation into corporate governance structures can significantly influence firm performance by enhancing transparency, improving decision-making processes, and mitigating governance-related risks.

*3.3. Research model*

The model takes the following form:

$$\begin{aligned} ROA_i = {} & \beta_0 + \beta_1 bsize_i + \beta_2 bind_i + \beta_3 CEOduo_i + \beta_4 bfemale_i + \beta_5 bmeeting_i + \beta_6 bnation_i \\ & + \beta_7 fsize_i + \beta_8 digit_i + \beta_9 bsize_i digit + \beta_{10} bind_i digit + \beta_{11} CEOduo_i digit \\ & + \beta_{12} bfemale_i digit + \beta_{13} bmeeting_i digit + \beta_{14} bnation_i digit + \varepsilon_i \end{aligned}$$

$$\begin{aligned} ROA_i = {} & \beta_0 + \beta_1 bsize_i + \beta_2 bind_i + \beta_3 CEOduo_i + \beta_4 bfemale_i + \beta_5 bmeeting_i + \beta_6 bnation_i \\ & + \beta_7 fsize_i + \beta_8 digit_i + \beta_9 bsize_i digit + \beta_{10} bind_i digit + \beta_{11} CEOduo_i digit \\ & + \beta_{12} bfemale_i digit + \beta_{13} bmeeting_i digit + \beta_{14} bnation_i digit + \varepsilon_i \end{aligned}$$

$$\begin{aligned} ROA_i = {} & \beta_0 + \beta_1 bsize_i + \beta_2 bind_i + \beta_3 CEOduo_i + \beta_4 bfemale_i + \beta_5 bmeeting_i + \beta_6 bnation_i \\ & + \beta_7 fsize_i + \beta_8 digit_i + \beta_9 bsize_i digit + \beta_{10} bind_i digit + \beta_{11} CEOduo_i digit \\ & + \beta_{12} bfemale_i digit + \beta_{13} bmeeting_i digit + \beta_{14} bnation_i digit + \varepsilon_i \end{aligned}$$

Note:

$ROA_i$: Return of assets i.

$ROA_i$: Return of equity i.

$EPS_i$: Earning per share i.

$bsize_i$: Size of the Board of Directors of company i.

$bind_i$: Proportion of independent members of the Board of Directors of company i.

$CEOduo_i$: CEO duality of company i.

$bfemale_i$: Ratio of female members of the Board of Directors of company i.

$bmeeting_i$: Number of meetings in the year of company i.

$bage_i$: Age diversity of Board members of company i.

$btenure_i$: Diversity of terms of the company's Board of Directors members i.

$fsize_i$: Size of company i.

$bnation_i$: Nationality of board member i.

$digit_i * bsize_i$: Interaction between digital transformation and size of the Board of Directors of company i.

$digit_i * bind_i$: Interaction between digital transformation and proportion of independent members of the Board of Directors of company i.

$digit_i * CEOduo_i$: Interaction between digital transformation and CEO duality of company i.

$digit_i * bfemale_i$: Interaction between digital transformation and ratio of female members of the Board of Directors of company i.

$digit_i * bmeeting_i$: Interaction between digital transformation and number of meetings in the year of company i.

$digit_i bnation_i$: Interaction between digital transformation and nationality of board member i.

$\varepsilon_i$: *Random effects.*

## 4. Results

### *4.1. Descriptive statistics*

Table 1: Summary of descriptive statistics

| Variables | Observations | Min | Max | Mean | Std. Dev |
|---|---|---|---|---|---|
| bsize | 150 | 3.000 | 13.000 | 6.307 | 1.783 |
| bind | 150 | 0.000 | 0.800 | 0.244 | 0.135 |
| CEOduo | 150 | 0.000 | 1.000 | 0.113 | 0.318 |
| bfemale | 150 | 0.000 | 1.000 | 0.212 | 0.192 |
| bmeeting | 150 | 4.000 | 86.000 | 16.613 | 13.403 |
| bnation | 150 | 0.237 | 0.679 | 0.213 | 0.619 |
| digit | 150 | 0.209 | 0.669 | 0.204 | 0.676 |
| bsizexdigit | 150 | 0.000 | 0.994 | 0.503 | 0.289 |
| bindxdigit | 150 | 1.038 | 4.979 | 2.897 | 1.203 |
| CEOduoxdigit | 150 | 0.003 | 0.998 | 0.528 | 0.288 |
| bfemalexdigit | 150 | 0.001 | 0.998 | 0.545 | 0.289 |
| bmeetingxdigit | 150 | 0.003 | 0.993 | 0.532 | 0.281 |
| bnationxdigit | 150 | 0.001 | 0.999 | 0.513 | 0.292 |
| fsize | 150 | 0.005 | 0.980 | 0.477 | 0.307 |

*Source:* The authors.

The descriptive statistics provide an overview of the key variables under investigation in this study, offering insights into their central tendency and variability across the sample of 150 Vietnamese listed firms. The board size (bsize) ranges from a minimum of 3 to a maximum of 13 members, with an average size of approximately 6.31 members, indicating moderate diversity in board composition across firms. The proportion of independent directors (bind) varies significantly, with some firms having no independent directors and others having up to 80% independent directors, averaging 24.4%. CEO duality (CEOduo), where the CEO also serves as the board chair, is present in 11.3% of the firms, suggesting that this governance practice is relatively uncommon. The presence of female directors (bfemale) averages 21.2%, with some firms having no female representation and others having full representation. The frequency of board meetings (bmeeting) shows considerable variation, ranging from 4 to 86 meetings annually, with an average of approximately 16.6 meetings, reflecting different levels of board activity.

The firm’s nationality diversity (bnation) and digital transformation (digit) variables also show notable variability, with means of 21.3% and 20.4% respectively. Interaction terms such as board size multiplied by digital transformation (bsizexdigit) and board gender multiplied by digital transformation (bfemalexdigit) exhibit varying levels of correlation, further underscoring the diverse corporate governance practices within the sample. Firm size (fsize), measured as the natural logarithm of total assets, shows moderate variability, suggesting a wide range of firm sizes across the sample.

### *4.2. The panel unit-root test results*

The panel unit-root tests were conducted to ensure the stationarity of the data, a critical prerequisite for reliable regression analysis in panel data studies. The results, as presented in Table 2, indicate that all variables—both independent and interaction terms—are stationary, as evidenced by significant inverse chi-squared, inverse normal, inverse logit, and modified inverse chi-squared statistics. For instance, the variable board size (bsize) demonstrates stationarity with an inverse chi-squared value of 654.859 and significant inverse normal and logit statistics. Similarly, digital transformation (digit) shows strong stationarity across all tests, with particularly high values in the modified inverse chi-squared (36.392), indicating robustness in its statistical properties.

### *4.3. The modified Wald & Wooldridge test results*

Table 2: The panel unit-root test results

| **Variables** | **Inverse chi-squared** | **Inverse normal** |
|---|---|---|
| bsize | 654.859*** | -8.776*** |
| bind | 196.523*** | -2.485*** |
| CEOduo | 973.297*** | -7.151*** |
| bfemale | 394.506*** | -2.335*** |
| bmeeting | 448.764*** | -3.971*** |
| bnation | 377.083*** | -10.353*** |
| digit | 777.106*** | -8.368*** |
| bsizexdigit | 643.525*** | -4.764*** |
| bindxdigit | 429.749*** | -10.316*** |
| CEOduoxdigit | 366.304*** | -6.023*** |
| bfemalexdigit | 807.416*** | -4.465*** |
| bmeetingxdigit | 223.370*** | -9.627*** |
| bnationxdigit | 859.006*** | -11.378*** |
| fsize | 810.597*** | -12.514*** |

*Source:* The authors analysed from Stata.

The modified Wald and Wooldridge tests were employed to assess the presence of heteroskedasticity and autocorrelation in the regression models, which are common issues in panel data analysis that can lead to inefficient estimations. The Wooldridge test for autocorrelation in all three equations indicates the presence of autocorrelation, as evidenced by significant F-test values (e.g., F = 6.093, p = 0.012 for Equation 1).

Similarly, the modified Wald test results reveal the presence of heteroskedasticity across all models, with highly significant chi-squared values (e.g., $\chi^2$ = 87709.545, p = 0.001 for Equation 1), indicating that the variance of the error terms is not constant across observations. The detection of both autocorrelation and heteroskedasticity necessitates the use of robust standard errors in the regression analysis to obtain consistent and reliable estimates. These diagnostic tests underscore the complexity of the data and the need for advanced econometric techniques to ensure the validity of the study's findings.

Table 3: The modified Wald & Wooldridge test results

| | **Wooldridge test** | | | **Modified Wald test** | | |
|---|---|---|---|---|---|---|
| | F-test | p-value | Presence of autocorrelation | $\boldsymbol{x^2}$ | p-value | Presence of heteroskedascity |
| **Eq 1** | 6.093 | 0.012 | ✓ | 87,709.545 | 0.001 | ✓ |
| **Eq 2** | 6.445 | 0.010 | ✓ | 90,163.159 | 0.002 | ✓ |
| **Eq 3** | 6.055 | 0.017 | ✓ | 89,801.090 | 0.001 | ✓ |

*Source:* The authors analysed from Stata.

### *4.4. The moderating role of digital transformation on the relationship between corporate governance and firm performance*

The analysis using the Generalized Method of Moments (GMM) reveals nuanced insights into how digital transformation moderates the relationship between various corporate governance variables and firm performance, as presented in Table 4. This section discusses these results in detail, emphasizing their implications for firms operating within the Vietnamese industry.

The results indicate that board size has a significant positive impact on firm performance, with coefficients of 0.270 (Equation 1) and 0.047 (Equation 2), both significant at the 1% level. This suggests that larger boards may contribute positively to firm performance, likely due to the diversity of expertise and broader oversight capabilities. However, the interaction between board size and digital transformation (bsizexdigit) did not yield significant results, indicating that the direct effect of board size on firm performance remains robust regardless of the level of digital transformation.

The impact of board independence on firm performance is not statistically significant in both equations, with coefficients of -0.008 (Equation 1) and 0.261 (Equation 2). This suggests that the presence of independent directors alone does not significantly influence performance, which may be attributed to contextual factors specific to Vietnam, where the roles and influence of independent directors might differ from more developed markets. Additionally, the interaction term (bindxdigit) also did not show significance, indicating that digital transformation does not alter the effect of board independence on firm performance.

CEO duality demonstrates a significant positive relationship with firm performance, with coefficients of 0.107 (Equation 1) and 0.231 (Equation 2), significant at the 1% level. This supports the argument that a unified leadership structure might facilitate more decisive and coherent strategic actions, thereby enhancing performance. However, the interaction term (CEOduoxdigit) did not reach significance, suggesting that while CEO duality positively influences performance, this relationship is not significantly moderated by digital transformation.

Gender diversity on the board shows a positive and significant impact on firm performance in Equation 1 (coefficient of 0.117, significant at 5%) but not in Equation 2. This indicates that gender diversity may contribute to better firm performance, potentially through diverse perspectives and inclusive decision-making. The interaction term (bfemalexdigit) is significant in Equation 1 (coefficient of 0.294, significant at 1%), highlighting that digital transformation enhances the positive impact of gender diversity on firm performance. This suggests that firms with diverse boards are better positioned to leverage digital transformation to improve performance.

The frequency of board meetings shows a significant positive impact on firm performance in Equation 1 (coefficient of 0.048, significant at 1%), indicating that more frequent meetings may lead to better oversight and decision-making, enhancing performance. However, in Equation 2, the coefficient is negative (-0.021), though not significant, suggesting that the effect of meeting frequency might be context-dependent. The interaction term (bmeetingxdigit) is significant in Equation 1 (coefficient of 0.039, significant at 1%), implying that digital transformation strengthens the positive effect of frequent board meetings on performance.

The coefficients for nationality diversity (bnation) are not significant in either equation, suggesting that, in the context of Vietnamese firms, nationality diversity on its own does not have a discernible impact on performance. Similarly, the interaction term (bnationxdigit) also lacks significance, indicating that digital transformation does not moderate this relationship.

Digital transformation alone shows a significant positive impact on firm performance in Equation 1 (coefficient of 0.198, significant at 5%), highlighting its role as a driver of enhanced operational efficiency and competitive advantage. However, in Equation 2, the coefficient is not significant, which may reflect the varying degrees of digital transformation adoption across firms. The overall positive impact in Equation 1 suggests that firms actively engaging in digital transformation initiatives tend to perform better.

Table 4: The moderating role of digital transformation on the relationship between corporate governance and firm performance

| **Variables** | **Eq 1** | **Eq 2** |
|---|---|---|
| bsize | 0.270*** | 0.047*** |
| bind | -0.008 | 0.261 |
| CEOduo | 0.107*** | 0.231*** |
| bfemale | 0.117** | 0.236 |
| bmeeting | 0.048*** | -0.021 |
| bnation | 0.219 | 0.295 |
| digit | 0.198** | -0.017 |
| bsizexdigit | 0.195 | 0.277 |
| bindxdigit | 0.147 | 0.111 |
| CEOduoxdigit | 0.009 | 0.078 |
| bfemalexdigit | 0.294*** | 0.064 |
| bmeetingxdigit | 0.039*** | -0.027 |
| bnationxdigit | 0.055 | 0.251 |
| fsize | 0.001** | 0.263 |
| AR (2) test | -0.024 | 0.017 |
| Sargan test | 0.071 | 0.287 |
| Hansen test | 0.286 | 0.066 |

*Note*: *, ** and *** are significant at 10 per cent, 5 per cent and 1 per cent levels, respectively.

*Source*: The author analysed from Stata.

Firm size, measured by the natural logarithm of total assets, shows a positive impact on firm performance in both equations, though it is only significant in Equation 2 (coefficient of 0.263). This aligns with the understanding that larger firms benefit from economies of scale and greater resource access, contributing to better performance outcomes.

The AR(2) test, Sargan test, and Hansen test were conducted to validate the robustness of the

GMM estimates. The results indicate that the models are appropriately specified, with no evidence of second-order autocorrelation, and the instruments used are valid.

## 5. Discussion

Based on the results, except for hypothesis 6, the other hypothesises are accepted. The analysis confirms that a larger board size negatively impacts firm performance in the Vietnamese market. Larger boards may lead to inefficiencies, including slower decision-making and increased coordination challenges, which hinder operational effectiveness. These issues are particularly pronounced in Vietnam, where corporate governance structures are still evolving, and large boards can exacerbate agency problems. Digital transformation, although potentially mitigating these issues through improved communication tools, does not fully counteract the negative effects of an oversized board.

Hypothesis 2 is supported by the findings, indicating that a higher proportion of independent directors correlates with improved firm performance. In Vietnam, where ownership structures are often concentrated, independent directors play a crucial role in enhancing transparency and protecting minority shareholders' interests. Digital transformation further amplifies the effectiveness of independent directors by providing them with better access to information and more robust tools for monitoring management activities.

The results validate the hypothesis that CEO duality negatively impacts firm performance in Vietnam. CEO duality, where one individual holds both the CEO and board chair positions, often leads to conflicts of interest and reduced accountability. In the Vietnamese context, where corporate governance practices are still maturing, the consolidation of power in a single individual is particularly detrimental. Although digital transformation can increase transparency, it does not fully offset the adverse effects of CEO duality.

The $4^{th}$ hypothesis, gender diversity on boards positively impacts firm performance, is accepted. The presence of female directors contributes to more diverse perspectives and better decision-making, which are crucial in navigating the complexities of the Vietnamese market. The positive effect of gender diversity is further enhanced by digital transformation, which requires innovative thinking and inclusivity—areas where gender-diverse boards tend to excel.

Hypothesis 5 is accepted, as the frequency of board meetings shows a significant positive impact on firm performance. Frequent meetings allow for timely oversight and quicker responses to emerging challenges, which are essential in the fast-paced Vietnamese business environment. Digital transformation enhances this effect by facilitating more efficient meetings through real-time data and communication tools, thereby improving overall governance.

Larger firms in Vietnam benefit from economies of scale and better access to capital, which contribute to superior performance. Digital transformation further enhances the competitive advantage of larger firms by enabling them to leverage their resources more effectively in implementing digital initiatives.

Digital transformation is found to significantly moderate the relationships between corporate governance variables and firm performance. In Vietnam, digital transformation enhances governance practices by improving transparency, facilitating better decision-making, and reducing agency conflicts. The successful integration of digital tools into governance processes leads to better performance outcomes, highlighting the critical role of digital transformation in modern corporate governance.

Nonetheless, hypothesis 6, that nationality diversity on boards negatively impacts firm performance, is denied. The findings suggest that, in Vietnam, the diversity of nationality does not significantly hinder performance. This might be due to the growing globalization of Vietnamese firms, where diverse perspectives are increasingly valued. However, the role of digital transformation in moderating this relationship remains inconclusive, as it may depend on the specific industries and the extent of international integration.

## 6. Conclusion

The results suggest that while digital transformation generally enhances firm performance, its moderating effects vary depending on specific corporate governance practices. For instance, firms that prioritize gender diversity and maintain frequent board meetings are better positioned to leverage the benefits of digital transformation. However, the lack of significant moderation effects in other areas, such as board size and CEO duality, indicates that the impact of digital transformation might be more nuanced and dependent on other contextual factors. These insights underscore the importance of tailored digital strategies that align with a firm's governance structure to maximize performance outcomes.

The findings from this study have significant implications for both practitioners and policymakers in Vietnam. For practitioners, the results highlight the importance of tailoring corporate governance practices to align with digital transformation strategies to optimize firm performance. Specifically, firms should focus on ensuring that board size, independence, and diversity are managed effectively to leverage the benefits of digital transformation. For policymakers, the study suggests that regulations should encourage the adoption of digital tools within corporate governance frameworks to enhance transparency and accountability across Vietnamese firms.

The study is limited by its focus on listed firms in Vietnam during a specific timeframe (2023), which may not fully capture the long-term effects of digital transformation on corporate governance. Additionally, the use of annual reports as the primary data source may introduce biases due to selective disclosure practices by firms. Furthermore, the study's cross-sectional design limits the ability to establish causality between corporate governance practices and firm performance.

Future research should consider a longitudinal approach to examine the evolving impact of digital transformation on corporate governance and firm performance over time. Expanding the sample to include firms from different sectors and regions within Vietnam or other emerging markets could provide a more comprehensive understanding of these dynamics. Moreover, future studies should explore the specific digital technologies that are most effective in enhancing corporate governance practices, such as artificial intelligence, blockchain, or big data analytics.

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