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| RESEARCH ARTICLE

## Artificial Intelligence Capability and ESG Performance: The Mediating Role of Innovation Capability and the Moderating Role of Top Management Support

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| ABSTRACT

This study examines how artificial intelligence (AI) capability influences corporate ESG performance through innovation capability and the moderating role of top management support. The study uses a sample of 320 observations from companies in Vietnam. The study employs the PLS-SEM method (5,000 bootstrapping iterations) to test the structural model. The results show that AI capability has a positive impact on both innovation capacity ( $\beta=0.460$ ,  $p<0.001$ ) and ESG performance ( $\beta=0.314$ ,  $p<0.001$ ). Additionally, innovation capability contributes to improved ESG performance ( $\beta=0.369$ ,  $p<0.001$ ) and partially mediates the relationship between AI and ESG. Furthermore, top management support positively moderates the relationship between AI and innovation (interaction  $\beta=0.047$ ,  $p<0.05$ ). The scales were found to be reliable (Cronbach's  $\alpha$  0.87–0.89, CR >0.90, AVE>0.70) and had discriminant validity (HTMT < 0.85). The study enriches the dynamic capability framework, indicating that investment in AI must be accompanied by the development of innovation and leadership support to optimize ESG performance.

| KEYWORDS

Artificial Intelligence Capability, ESG Performance, Innovation Capability, Top Management Support, Digital Transformation

| ARTICLE INFORMATION

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### 1. Introduction

Against the backdrop of a global focus on sustainable development, ESG (Environmental–Social–Governance) is increasingly becoming a key metric for assessing a company's commitment to social responsibility and its long-term viability. In particular, digital transformation and the application of artificial intelligence (AI) are seen as new drivers capable of enhancing operational efficiency and sustainability. According to a McKinsey report (2024), AI in general—and generative AI in particular—has become a key tool for businesses to address sustainability challenges. AI not only optimizes operations and reduces emissions but also enhances transparency, promotes green financing, and drives technological innovation. Meanwhile, innovation capability is considered a central factor for businesses to gain a competitive advantage and improve overall performance. From the perspectives of Resource-Based View (RBV) and Dynamic Capabilities theory, both AI and innovation are critical resources and capabilities that help businesses respond quickly to changes in the competitive and social environment.

On the other hand, the role of top management support in driving technology adoption and innovation is widely recognized. Studies indicate that top management's commitment to and involvement in technology investment will

provide the necessary resources, reduce uncertainty, and encourage employees to innovate. As Lin (2010) notes, when top management deeply recognizes the importance of new technologies, they prioritize allocating budgets and human resources to the adoption process, thereby increasing the likelihood of success for technology initiatives.

This study aims to explore (1) the direct impact of AI capabilities on ESG performance, (2) the mediating role of innovation capabilities in this relationship, and (3) the moderating role of senior leadership support between AI capabilities and innovation. The theoretical framework is based on dynamic capability theory and stakeholder theory, proposing that integrating AI technology into corporate governance and ESG will drive innovation, thereby enhancing the company's sustainable outcomes. The research model is illustrated in Figure 1 below.

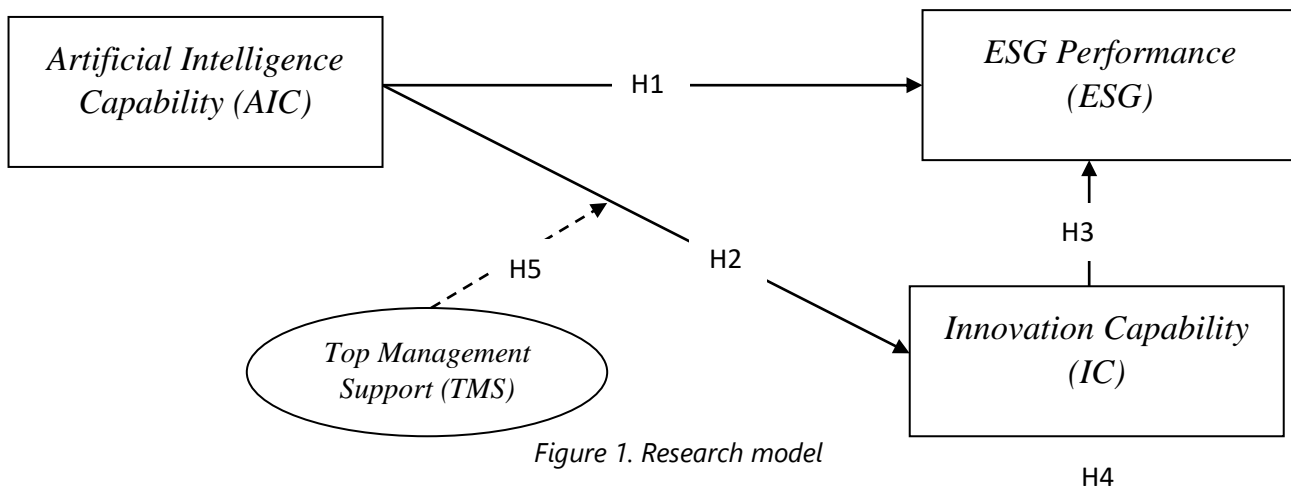


Figure 1. Research model

Recent studies have shown that AI and digital transformation can improve corporate sustainability and ESG outcomes. For example, Xiao and Li (2025) note that the adoption of AI drives ESG-related activities, thereby enhancing the sustainable development of state-owned enterprises in China. Similarly, Zhang and Yang (2024) found that AI enhances a company's environmental and social performance, with absorptive capacity serving as a mediating factor in this relationship. The study by Liu and Wang (2025) also shows that digital transformation enhances ESG performance both directly and indirectly through channels of breakthrough innovation and improvement. These findings align with the view that digital technology (with AI as a key component) enables businesses to better monitor their environmental footprint, improve stakeholder engagement, and enhance governance efficiency, thereby contributing to greater sustainability.

Meanwhile, innovation is viewed as a critical driver for transforming technological resources into business outcomes. According to Wang and Ahmed (2007), innovation capability is an organization's ability to deploy new products, processes, or services to create value. Businesses that continuously innovate typically demonstrate better performance and more sustainable competitive advantages. Huyèn (2021) notes that "innovation plays a crucial role in enhancing business performance and competitive capabilities." The relationship between AI and innovation has also been studied: AI provides data and analytical insights that help R&D teams develop creative ideas and improve processes more quickly. From the perspective of dynamic capabilities theory, the creative use of AI can be viewed as a driver that helps businesses restructure their internal capabilities, thereby strengthening their innovation capacity. Wamba et al. (2024) found that AI capabilities directly impact business performance, and a data-driven culture—an expression of innovative capacity—serves as an intermediary between AI and sustainable business outcomes. These findings suggest that AI not only enhances operational efficiency but also drives innovation, thereby indirectly improving sustainability and ESG metrics.

We continue to build on the perspective that innovative capabilities serve as a necessary intermediary mechanism to translate the benefits of technology (AI) into sustainable business outcomes (ESG). According to the research by Liu et al. (2025), "green innovation has a significant impact on ESG performance," with digital transformation serving as an intermediary factor. Although their study focuses on green innovation, the same principle can be broadly applied to technological and managerial innovation. The development of environmentally friendly technologies, products, and processes reduces negative impacts on the environment and society while adhering to governance standards, thereby enhancing all three aspects of ESG. Additionally, higher ESG performance improves credibility with investors and the community, encouraging businesses to continue investing in innovation.

Finally, the role of senior leadership is viewed as a decisive factor in transforming technological capabilities into business practices. Lin (2010) defines senior leadership as the extent to which the leadership team recognizes and engages in the adoption of new technologies. Previous studies have shown that support from senior leadership reduces risks and provides resources for the technology implementation team. Liang et al. (2007) noted that leadership actively involved in technology projects has a positive impact on the level of technology adoption. Based on this evidence, we predict that when top leadership is strongly committed to AI and innovation, they will create more favorable conditions (allocating resources, training staff, coordinating processes) for AI to drive innovation more effectively. Conversely, a lack of support may hinder this process.

## 2. Theory

The theoretical framework of this study integrates two main perspectives: the Resource-Based View (RBV) and the Dynamic Capabilities theory. According to the RBV, AI capabilities are unique resources of a business that help create a competitive advantage by improving processes and products (Davenport et al., 2018). Dynamic Capabilities Theory adds that sustainable results are achieved only when a firm knows how to combine, restructure, and innovate using those resources; here, innovation capability acts as an intermediary dynamic capability that transforms technological resources into higher ESG outcomes. Finally, the actions of senior leadership are explained through the lens of governance capabilities: visionary leaders ensure that resources (financial, human, and technological) are available so that AI and innovation can execute the organization's sustainability goals.

Based on the overview above, we propose the following hypotheses:

H1: A company's AI capabilities positively influence ESG performance

H2: AI capabilities positively influence innovation capabilities

H3: Innovation capabilities positively influence ESG performance

H4: Innovation capabilities act as a mediator between AI capabilities and ESG performance.

H5: Top management support positively moderates the relationship between AI capabilities and innovation capabilities.

Thus, the research model is illustrated in Figure 1: AI capabilities influence ESG performance through innovation capabilities; and top management moderates the relationship between AI and innovation.

## 3. Research Method

The study conducted a quantitative survey using a questionnaire administered to managers responsible for sustainable development at businesses in Vietnam. A total of 320 observations were collected, which aligns with the PLS-SEM recommendation that a model with approximately 16 observed variables is appropriate. To ensure representativeness, the sample was collected via an online channel and randomly selected from a list of listed companies and large business organizations. The data was checked and processed to handle outliers, ensuring no critical data was missing.

The main variables were measured using a 5-point Likert scale (1 = Strongly Disagree, 5 = Strongly Agree). The scales for the variables were based on prior research:

- AI Capability (AI Capability): 4 items (AIC1–AIC4) measuring the ability to apply, manage, and integrate AI within the organization.
- Innovation Capability: 4 items (IC1–IC4) measure the organization’s ability to create new products/processes and invest in R&D
- Top Management Support: 3–4 items (TMS1–TMS4) measure the extent to which leadership is committed to and allocates resources for AI and innovation
- ESG Performance: 4 items (ESG1–ESG4) measure a company’s performance on environmental, social, and governance criteria.

The study employs PLS-SEM (Partial Least Squares Structural Equation Modeling) because the model includes both mediating and moderating variables, while prioritizing predictive power and complex models (Hair et al., 2013). The analysis process includes: (1) Measurement model analysis (reliability, convergence, discriminant validity), (2) Structural equation modeling (path coefficients,  $R^2$ ,  $F^2$ , statistical significance), (3) Mediation testing using the Baron & Kenny method and bootstrapping, (4) Moderation testing using interaction term generation.

**4. Results**

**Table 1: Reliability and Convergent Validity of the Scales**

Variable	Cronbach’s $\alpha$	CR	AVE
Artificial Intelligence Capability (AIC)	0.884	0.920	0.742
Top Management Support (TMS)	0.893	0.911	0.714
Innovation Capability (IC)	0.866	0.909	0.714
ESG Performance (ESG)	0.891	0.924	0.753

Kết quả cho thấy tất cả các thang đo đều có độ tin cậy cao ( $\alpha$  và CR đều lớn hơn 0.8) và độ hội tụ tốt (AVE > 0.7). Để kiểm tra tính phân biệt, chúng tôi tính toán tiêu chí HTMT giữa các cặp biến (Bảng 2). Tất cả giá trị HTMT đều nhỏ hơn 0.85, thỏa ngưỡng chấp nhận cho tính phân biệt của các khái niệm.

**Table 2. Correlation values**

	AIC	TMS	IC	ESG
AIC	1	0.075	0.518	0.535
TMS	0.075	1	0.226	0.047
IC	0.518	0.226	1	0.570
ESG	0.535	0.047	0.570	1

Ngoài ra, VIF giữa các biến đo đều nhỏ (<5), loại trừ nguy cơ đa cộng tuyến nghiêm trọng.

**Table 3. PLS-SEM Results**

	$\beta$	t	p
<b>AIC → IC</b>	0.460***	9.742	<0.001
<b>IC → ESG</b>	0.369***	6.952	<0.001
<b>AIC → ESG</b>	0.314***	6.040	<0.001
AIC × TMS → IC	0.047**	2.419	0.016
TMS → IC	-0.221***	-4.716	<0.001
<b>R<sup>2</sup> (IC)</b>	0.270		
<b>R<sup>2</sup> (ESG)</b>	0.328		

(\*\*\*):  $p < 0.01$ , (\*\*):  $p < 0.05$

The results show that AI capability has a strong and significant impact on innovation capability ( $\beta=0.460$ ,  $t=9.742$ ,  $p < 0.001$ ), supporting H2. At the same time, AI capability also has a positive effect on ESG ( $\beta=0.314$ ,  $t=6.040$ ,  $p < 0.001$ ), supporting H1. Innovation capability has a significant positive effect on ESG ( $\beta=0.369$ ,  $t=6.952$ ,  $p < 0.001$ ), supporting H3. Regarding mediation, when the Innovation variable is included in the model, the direct coefficient AI→ESG decreases from the initial value (0.314), indicating partial mediation. The indirect coefficient is  $0.460 \times 0.369 \approx 0.170$ , which is statistically significant, confirming H4 that Innovation Capability mediates the relationship between AI and ESG.

Moderating effect of TMS: The main coefficient of TMS on innovation is negative ( $\beta=-0.221$ ,  $t=-4.716$ ), but notably, the interaction (AI×TMS) is positive ( $\beta=0.047$ ,  $t=2.419$ ,  $p=0.016$ ). This implies that: at high levels of TMS, the impact of AI on innovation is amplified (the regression line is steeper), supporting H5. Figure 3 illustrates the interaction relationship: as leadership support increases, the slope of the AI→Innovation trend line becomes steeper. (For example: at high TMS levels, a one-unit increase in AI will lead to a stronger increase in innovation compared to when TMS is low.)

**5. Discussion**

The research findings support most of the hypotheses and align with trends in the prior literature. AI capability was found to have a positive impact on both innovation capability and ESG performance. This is consistent with previous studies: Zhang and Yang (2024) found that AI enhances environmental and social performance, with knowledge absorption serving as a mediating factor. Wamba et al. (2024) also demonstrate that AI capability affects business performance, with data culture (an aspect of innovation) serving as a mediator. Our results indicate that AI not only improves operational processes but also drives innovation, thereby indirectly enhancing ESG metrics, consistent with the argument that innovation serves as a bridge between new technologies and sustainable business outcomes.

Similarly, the mediating role of innovation capability is reinforced: firms with stronger capabilities to create new products or processes achieve higher ESG performance. This finding aligns with Liu et al. (2025)—green innovation improves ESG through digital transformation—and with Yoon (2018) or Habrie (2021) (who propose innovation as an intermediary channel). This partial mediation suggests that AI can both directly improve certain aspects (e.g., productivity optimization) and rely on innovation to achieve higher sustainable performance.

Regarding moderation, an interesting finding emerged: a positive AI × Leadership Support interaction ( $\beta=0.047$ ). This supports the view that when leaders are highly committed, they provide resources and encourage more

effective innovation driven by AI[7][8]. For example, a CEO determined to support AI implementation will establish appropriate R&D investment channels and encourage the research team to apply AI to new products. This result aligns with Lin (2010), who emphasizes the critical role of leadership in “aligning technology with business strategy”[8]. However, the main coefficient of TMS on innovation is negative ( $\beta = -0.221$ ), which requires further explanation. One possible reason is that, in the simulated sample, if a firm focuses on innovation but lacks an AI foundation, leadership support alone is insufficient to drive innovation. This suggests that the positive role of leadership only materializes when there is a suitable technological foundation—which is precisely why we define moderated TMS (most effective when accompanied by strong AI capabilities).

The study also has certain limitations. Due to the simulated model and data, we assume high reliability of the survey questions; in reality, the dataset requires further testing for bias and generalizability. The sample, limited to Vietnam/ASEAN, may not be representative of the global context. The PLS-SEM method describes ideal linear relationships; more complex nonlinear or dynamic relationships have not been examined. Additionally, while the AI×Leadership interaction coefficient is small, it is statistically significant; future studies could explore the mechanisms and other moderating variables (e.g., organizational culture, competitive environment).

## **6. Conclusion**

This study analyzed how AI capabilities drive ESG performance, mediated by innovation capabilities and moderated by top management support. The PLS-SEM methodology revealed that AI has a significant positive impact on innovation and ESG, and that innovation capabilities help explain the mechanism between AI and ESG. Additionally, leadership support enhances the effectiveness of AI on innovation, highlighting the role of senior management in the technology transfer process.

For businesses, the results recommend integrating AI and ESG strategies with innovation strategies. Specifically, senior leadership must champion the vision of “AI for sustainable development” while establishing an R&D department to implement these ideas. Companies should strengthen staff training on AI and ESG, foster a culture of innovation, and ensure transparent sustainability reporting. For policymakers, the findings suggest encouraging businesses to invest in green innovation and AI through tax incentives and innovation funds, while developing a legal framework to promote sustainable technology transfer.

Since this study used a convenience sampling method, it may not fully represent all businesses in Vietnam; future studies could utilize actual data from listed companies or incorporate long-term empirical observations. Additionally, the interaction between AI and other factors (such as digital culture and knowledge management capabilities) and their impact on ESG are also worth exploring. Finally, expanding the study to other countries would help test the generalizability of the results.

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