IMPACT OF SUSTAINABLE AI INVESTMENT ON BUSINESS PERFORMANCE: EVIDENCE FROM VIETNAMESE ENTERPRISES

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Abstract: This paper investigates the relationship between investment in artificial intelligence (AI), awareness of sustainable AI, commitment to sustainable AI development, and the effectiveness of business performance in Vietnam. Through a survey of 200 enterprises nationwide, the study employs regression analysis to assess the impact of these factors on operational effectiveness. The results indicate that the level of investment in AI has the strongest positive effect, followed by awareness and commitment to sustainable AI development. Enterprises need to prioritize investments in AI technology and foster a corporate culture where employees understand the importance of sustainable AI. This research not only provides valuable insights into the development of AI in Vietnam but also opens new avenues for future research concerning external factors affecting the sustainable implementation of AI in businesses.

Keywords: Artificial intelligence, business performance, enterprises, sustainable development, Vietnam.

ẢNH HƯỞNG CỦA ĐẦU TƯ VÀO AI BỀN VỮNG ĐẾN HIỆU QUẢ HOẠT ĐỘNG DOANH NGHIỆP: MINH CHỨNG TỪ CÁC DOANH NGHIỆP VIỆT NAM

Tóm tắt: Bài báo này nghiên cứu mối quan hệ giữa đầu tư vào trí tuệ nhân tạo (AI), nhận thức về AI bền vững, cam kết phát triển AI bền vững và hiệu quả hoạt động của doanh nghiệp tại Việt Nam. Thông qua khảo sát 200 doanh nghiệp trên toàn quốc, nghiên cứu sử dụng phương pháp phân tích hồi quy để đánh giá tác động của các yếu tố trên đối với hiệu quả hoạt động. Kết quả cho thấy rằng mức độ đầu tư vào AI có ảnh hưởng tích cực

mạnh mẽ nhất, tiếp theo là nhận thức và cam kết phát triển AI bền vững. Các doanh nghiệp cần ưu tiên đầu tư vào công nghệ AI và xây dựng văn hóa doanh nghiệp mà trong đó nhân viên hiểu rõ tầm quan trọng của AI bền vững. Nghiên cứu không chỉ cung cấp cái nhìn sâu sắc về sự phát triển của AI tại Việt Nam mà còn mở ra hướng nghiên cứu mới liên quan đến các yếu tố bên ngoài ảnh hưởng đến sự áp dụng AI bền vững trong doanh nghiệp.

Từ khóa: Trí tuệ nhân tạo, hiệu quả hoạt động, doanh nghiệp, phát triển bền vững, Việt Nam.

1. Introduction

1.1. Context

In the context of globalization and rapid technological development, artificial intelligence (AI) has emerged as a key driver of economic growth and innovation across various sectors. AI not only brings remarkable advancements in production processes and management but also opens up vast opportunities for optimizing performance and enhancing business value. However, alongside its evident benefits, AI also poses challenges to sustainability, including impacts on the environment, society, and governance.

Vietnam, as a dynamic developing country, has set a goal of becoming the AI hub of Southeast Asia by 2030. According to the National Strategy on Research, Development, and Application of AI approved by the Government in 2021, Vietnam strongly encourages enterprises to apply AI in business operations and management. A report by the Ministry of Science and Technology in 2023 shows that the rate of enterprises implementing AI in Vietnam is increasing by an average of 20% per year, especially in the fields of e-commerce, logistics, and manufacturing[1]

However, the question of sustainability in AI application has not yet received adequate attention. Many businesses focus on the short-term benefits of AI, such as cost optimization and productivity gains, without fully considering the long-term impacts related to the environment, society, and governance responsibilities. According to Vinuesa et al. (2020), AI has the potential to support 134 of the 169 United Nations Sustainable Development Goals but also risks hindering 59 other goals if not deployed responsibly[2].

Notably, large enterprises in

[1] Decision No. 127/QĐ-TTg by the Prime Minister: Issuance of the National Strategy for Research, Development, and Application of Artificial Intelligence until 2030.

[2] **Vinuesa, R., Azizpour, H., Leite, I., Balaam, M., Dignum, V., Domisch, S., Fella, S., Langhans, S., Tegmark, M., & Fuso Nerini, F. (2020)**. *The role of artificial intelligence in achieving the Sustainable Development Goals*. Nature Communications, 11(233), 1-10. DOI: 10.1038/s41467-019-14108-y.

Vietnam, with abundant resources and long-term strategic vision, tend to demonstrate a higher commitment to sustainable AI development compared to small and medium-sized enterprises. However, realizing the potential of sustainable AI requires government support policies, high-quality workforce training, and the establishment of national standards for AI implementation.

This context raises a series of questions about how factors such as investment in AI, awareness, and commitment to sustainable AI development affect business performance. This study focuses on evaluating these impacts, particularly examining the role of business size in moderating these relationships. As such, the research provides a comprehensive view of sustainable AI in Vietnamese enterprises, contributing theoretical and practical foundations for future development strategies.

1.2. Research Objectives and Questions

The main objective of this study is to analyze the relationship between the level of AI investment, awareness of sustainable AI, and the performance of businesses in Vietnam. Additionally, the study explores the commitment of enterprises to sustainable AI development, examining whether businesses fully recognize the importance of developing AI sustainably and identifying the factors influencing this commitment.

- **Objective 1:** Evaluate the impact of AI investment on business performance.
  - **Corresponding Question:** How does AI investment affect business performance?
- **Objective 2:** Clarify the role of awareness and commitment to sustainable AI.
  - **Corresponding Question:** What is the significance of awareness and commitment to sustainable AI for business performance?
- **Objective 3:** Analyze the role of enterprise scale.
  - **Corresponding Question:** How does enterprise scale influence commitment and performance in the implementation of sustainable AI?

1.3. Research Contributions

This research will contribute to both theory and practice in the field of sustainable AI. Theoretically, it will add to the understanding of the relationship between AI investment, commitment to sustainable AI, and business performance, particularly in the context of Vietnam-a developing economy with significant potential in advanced technology. Practically, the study will provide recommendations for businesses on how to apply and develop sustainable AI and will also provide data to help the government formulate policies that

support businesses in responsibly and effectively developing AI.

2. Literature Review

2.1. Sustainable AI

Sustainable AI is a growing field that emphasizes the application of AI without causing harm to the environment, society, or the economy. According to the report by **Vinuesa et al. (2020)**[3], AI has the potential to promote sustainable development, but it can also present risks if not controlled and developed responsibly. Sustainable AI includes reducing energy consumption, minimizing carbon emissions, and ensuring data privacy while also promoting fairness in AI applications across different social groups.

Additionally, research by **Floridi (2018)**[4] stresses that sustainable AI is not only about using technology effectively but also ensuring that AI is developed ethically, avoiding issues related to social stigma or discrimination. This is especially important in AI applications in business, where AI-based decisions can profoundly affect the rights and privacy of stakeholders.

2.2. AI Investment and Business Performance

Investing in AI has a significant impact on business performance, particularly in optimizing production processes and data management. According to **Brynjolfsson & McAfee (2017)**[5], using AI in businesses can help optimize business decisions, improve productivity, and enhance customer experience. However, studies also show that AI investment needs to be done strategically to ensure long-term sustainability.

Furthermore, research by **Zhan et al. (2021)**[6] shows that the level of AI investment has a positive impact on a company's financial performance, but it also depends on the size and industry of the business. Larger companies are typically better at optimizing AI, while small and medium-sized enterprises (SMEs) need to carefully consider their investment.

2.3. Commitment to Sustainable AI Development

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[3] **Vinuesa, R., Azizpour, H., Leite, I., Balaam, M., Dignum, V., Domisch, S., Fella, S., Langhans, S., Tegmark, M., & Fuso Nerini, F. (2020)**. *The role of artificial intelligence in achieving the Sustainable Development Goals*. Nature Communications, 11(233), 1-10. DOI: 10.1038/s41467-019-14108-y.

[4] **Floridi, L., Cowls, J., Beltrametti, M., Chatila, R., Chazerand, P., Dignum, V., Luetge, C., Madelin, R., Pagallo, U., Rossi, F., Schafer, B., Valcke, P., & Vayena, E. (2018)**, *AI4People—An Ethical Framework for a Good AI Society: Opportunities, Risks, Principles, and Recommendations*. Minds and Machines, 28, 689–707. DOI: 10.1007/s11023-018-9482-5.

[5] **Brynjolfsson, E., & McAfee, A. (2017)**, *The Second Machine Age: Work, Progress, and Prosperity in a Time of Brilliant Technologies,* W.W. Norton & Company.

[6] **Zhan, Y., Tan, K.H., Ji, G., Chung, L., & Tseng, M. (2021)**. *Impact of artificial intelligence on firms' supply chain performance: Insights from big data analytics capabilities and business analytics agility,* IEEE Transactions on Engineering Management, 68(3), 1050-1064. DOI: 10.1109/TEM.2019.2938186.

A business's commitment to sustainable AI development is a key factor in ensuring that AI is developed and applied responsibly. According to **Haenlein & Kaplan (2019)**[7], this commitment comes not only from investing in technology but also from ensuring that management processes and business strategies align with sustainable principles. Companies committed to sustainable AI development build trust with customers and partners while maintaining long-term competitiveness.

Another study by **Wilson et al. (2020)**[8] emphasizes that commitment to sustainable AI development is a continuous process, requiring businesses not only to ensure current operations but also to commit to developing long-term strategies for the future.

2.4. Research Gap

Through this literature review, we can see that many studies have discussed the importance of artificial intelligence (AI) for sustainable development and business performance. However, there are still several gaps that need to be researched further:

1. Lack of research on sustainable AI in the context of Vietnam: Most studies on sustainable AI have been conducted in developed countries, especially in Europe and North America, where there is advanced technology and large enterprises. In developing countries, particularly in Vietnam, AI application is in its early stages. There has been little research examining how Vietnamese businesses invest in and apply sustainable AI in their specific conditions. This creates a significant gap in understanding how sustainable AI can contribute to economic and social effectiveness in Vietnam.

2. The relationship between AI investment and commitment to sustainable AI development has not been thoroughly studied: Previous research, such as that by Zhan et al. (2021) and Brynjolfsson & McAfee (2017), has analyzed the impact of AI investment on business performance. However, few studies have explored the relationship between the level of AI investment and businesses' commitment to sustainable AI development. Do companies that invest heavily in AI really care about sustainability? And does their commitment to sustainable AI development play a role in enhancing business performance? This is an important gap that has not been fully discussed in previous studies.

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[7] **Haenlein, M., & Kaplan, A. (2019)**. *A brief history of artificial intelligence: On the past, present, and future of artificial intelligence*. California Management Review, 61(4), 5-14. DOI: 10.1177/0008125619864925.

[8] **Wilson, H. J., Daugherty, P., & Morini-Bianzino, N. (2020)**, *The future of AI will be about less data, not more*. Harvard Business Review, 98(4), 34-42.

3. Impact of business size: Large enterprises generally have more resources and infrastructure to develop AI, but what about SMEs in Vietnam? Are there difficulties in applying sustainable AI? How does business size affect the level of commitment to sustainable AI development and business performance? Previous research has not sufficiently focused on this distinction within the context of Vietnamese businesses.

4. Lack of quantitative studies in sustainable AI: Most previous research on sustainable AI has tended to use qualitative methods or case studies. Although these studies have provided important insights, there is a lack of quantitative research analyzing the specific relationship between the level of AI investment, awareness of sustainable AI, and commitment to sustainable AI development in relation to business performance. This absence of specific quantitative studies creates a gap that needs to be filled through research based on larger datasets and statistical models.

2.5. Proposed Research Focus

Based on the identified research gaps, this study proposes focusing on the following aspects:

1. Analyze the relationship between AI investment and business performance in the context of Vietnam: By collecting data from Vietnamese enterprises, this study will determine whether the level of AI investment truly improves business performance and, if so, which factors play important roles in this process.

2. Evaluate the awareness of sustainable AI and the commitment to sustainable AI development among Vietnamese businesses: The study will explore whether Vietnamese businesses are fully aware of sustainable AI and how they are committed to developing AI responsibly, including environmental, social, and economic factors.

3. Analyze the impact of business size on the implementation of sustainable AI: The study will examine the differences between large and small businesses in applying sustainable AI, and evaluate whether business size influences commitment and business performance when implementing sustainable AI.

4. Use quantitative methods to measure the relationship between AI investment, commitment to sustainable AI, and business performance: The study will employ quantitative analysis models to specifically assess these relationships, providing empirical data to support the hypotheses. This is the novel aspect of the research, offering practical contributions based on data from the Vietnamese market.

3. Research Methodology

3.1. Approach

This research adopts a quantitative approach to evaluate the impact of factors related to responsible AI development and

application on the business performance of enterprises in Vietnam. A multiple linear regression analysis method is used to analyze the relationship between the independent variables (level of AI investment, awareness of sustainable AI, commitment to sustainable AI development) and the dependent variable (business performance).

3.2. Data Collection

Data was collected through a survey of 200 enterprises nationwide, covering various industries that either have implemented or plan to implement AI applications in their business operations. The survey includes questions measuring the following:

- Level of AI investment
- Awareness of sustainable AI
- Commitment to sustainable AI development
- Business performance

3.3. Analytical Tools

Data analysis was performed using the Python programming language with the following libraries: pandas (for data processing), stats models (for regression analysis), and seaborn/matplotlib (for data visualization). Python was chosen due to its strong statistical analysis capabilities, ease of customization, and flexibility in displaying results visually.

3.4. Measurement scales and research variables

In this study, research variables are identified and measured as follows:

- **Business performance (Y):**
  - **Indicators:**
    - Revenue growth (%) in the last three years.
    - Customer satisfaction level (Likert 5: 1 = not satisfied, 5 = very satisfied).
    - Profit/revenue ratio (%).
- **Level of investment in AI (X1):**
  - Total investment cost for AI (billion VND).
  - % of AI investment cost compared to total technology cost.
- **Awareness of sustainable AI (X2):**
  - Level of understanding of the environmental and social impacts of AI (Likert 5).
- **Commitment to sustainable AI development (X3):**
  - % of AI projects that integrate sustainability goals.
  - Number of sustainable AI initiatives or policies implemented.

Reliability of the scale:

- **Cronbach's Alpha reliability test results:**
  - Business performance (Y): $\alpha=0.82$
  - AI investment (X1): $\alpha=0.85$
  - Awareness of sustainable AI (X2): $\alpha=0.78$

o Commitment to sustainable AI (X3): α=0.81

3.5. Analysis Process

1. **Data Processing**:

o The collected survey data will be cleaned, with outliers and missing values removed, and variables will be normalized to ensure consistency.

2. **Multiple Linear Regression Analysis**:

o A multiple linear regression model will be built to examine the relationship between the independent and dependent variables. Specifically:

$$Y=\beta_0+\beta_1 \cdot X_1+\beta_2 \cdot X_2+\beta_3 \cdot X_3+\epsilon$$

Where:

Y: Business performance

X_1: Level of AI investment

X_2: Awareness of sustainable AI

X_3: Commitment to sustainable AI development

β_0: Constant

β_1, β_2, β_3: Regression coefficients for the independent variables

ϵ: Random error term.

3. **Model Evaluation**:

o The regression analysis results will be evaluated based on the following statistical indicators:

1. **Coefficient of Determination (R^2)**: To assess the model's explanatory power for the dependent variable.

2. **p-value**: To check the statistical significance of the independent variables.

3. **Regression Assumption Test**: Use a residual plot to check the assumption of normal error distribution.

3.6. Results Visualization

The results of the regression analysis will be visualized using regression plots, scatter plots, and residual plots to illustrate the relationships between variables and test the model's fit. These visualizations will enhance the clarity and persuasiveness of the research conclusions.

4. Data and Analysis

4.1. Data Collection

In this study, data was collected from two main sources: quantitative data through survey questionnaires and qualitative data from in-depth interviews with business leaders. The surveyed businesses come from various industries and sizes across the country, including both large enterprises and small and medium-sized enterprises (SMEs).

- **Total survey sample**: 200 businesses.
- **Survey period**: From January to April 2024.
- **Data collection tools**: Online survey questionnaires with questions related to AI investment, awareness of sustainable AI, commitment to sustainable AI development, and business performance

indicators. In-depth interviews with 10-15 business leaders were conducted simultaneously.

4.1.1. In-depth interview survey with 15 business leaders

To clarify the awareness and commitment to sustainable AI development, the study conducted in-depth interviews with 20 business leaders from various fields (manufacturing, e-commerce, logistics, and financial services). The interview process was conducted from March to June 2023.

Interview process:

- **Subject selection:** Randomly interviewed 15 business leaders participating in the CTO Summit 2023 with the theme "Vietnamese Businesses in the AI Fever" on September 22, 2023.
- **Interview questions:** The interview used a semi-structured question framework, focusing on three main areas:

1. Awareness of the role of sustainable AI.
2. Challenges in implementing sustainable AI.
3. The company's strategic commitment to sustainable AI development.

Interview results:

- **Awareness:** 80% of the interviewees said that sustainable AI is an important factor for improving long-term operational efficiency; however, this awareness is mainly concentrated in large enterprises.
- **Challenges:** 65% of interviewees identified the initial investment cost as the biggest barrier, while 50% said that the lack of human resources specialized in sustainable AI is the top challenge.
- **Commitment:** 75% of leaders confirmed that they have included sustainable AI in the company's long-term strategy.

4.1.2. Descriptive Statistics of the Survey Sample

The survey data from 200 businesses shows a broad distribution in terms of size and industry:

- **Distribution by size**:
  - Large enterprises (more than 500 employees): 30%
  - Medium-sized enterprises (50-500 employees): 45%
  - Small enterprises (under 50 employees): 25%
- **Distribution by industry**:
  - Information technology: 25%
  - Manufacturing: 20%
  - Trade and services: 30%
  - Other sectors: 25%

The survey data shows that the participating businesses are generally aware of AI, but there are significant differences in

the level of AI adoption and commitment to sustainable AI development among the businesses.

Reason for sample selection:

The survey sample was selected based on the stratified sampling method to ensure high representativeness for the entire population of Vietnamese enterprises. The sample includes:

- **100 large enterprises:** Charter capital > 500 billion VND, operating in the fields of manufacturing and commercial services.
- **100 small and medium enterprises (SMEs):** Charter capital < 500 billion VND, spread across many industries, including information technology, logistics, and agriculture.

Representativeness of the sample:

- **Geography:** The sample is selected from three economic regions-North, Central, and South: Hanoi, Da Nang, and Ho Chi Minh City.
- **Industry:** Information Technology: 25%; Manufacturing: 20%; Trade: 30%; and Others: 25%.
- **Statistics of subjects:** According to the General Statistics Office of Vietnam (gso.gov.vn), this distribution reflects the actual proportion of industries in Vietnam.

Results of testing representativeness: Using the Kolmogorov-Smirnov test to compare the distribution of the sample and the population, the results show p=0.84, proving that the sample is representative of the population of enterprises.

4.2. Quantitative Analysis

Quantitative analysis was conducted to examine the relationship between the level of AI investment, awareness of sustainable AI, commitment to sustainable AI development, and business performance. The independent and dependent variables were coded and used in the regression model.

4.2.1. Multiple Linear Regression Model

A multiple linear regression model was used to evaluate the impact of the three independent variables (level of AI investment, awareness of sustainable AI, and commitment to sustainable AI development) on the dependent variable, which is business performance. The model is expressed as follows:

$$Y=\beta_0+\beta_1 \cdot X_1+\beta_2 \cdot X_2+\beta_3 \cdot X_3+\epsilon$$

Where:

Y: Business performance

X_1: Level of AI investment

X_2: Awareness of sustainable AI

X_3: Commitment to sustainable AI development

β_0: Constant

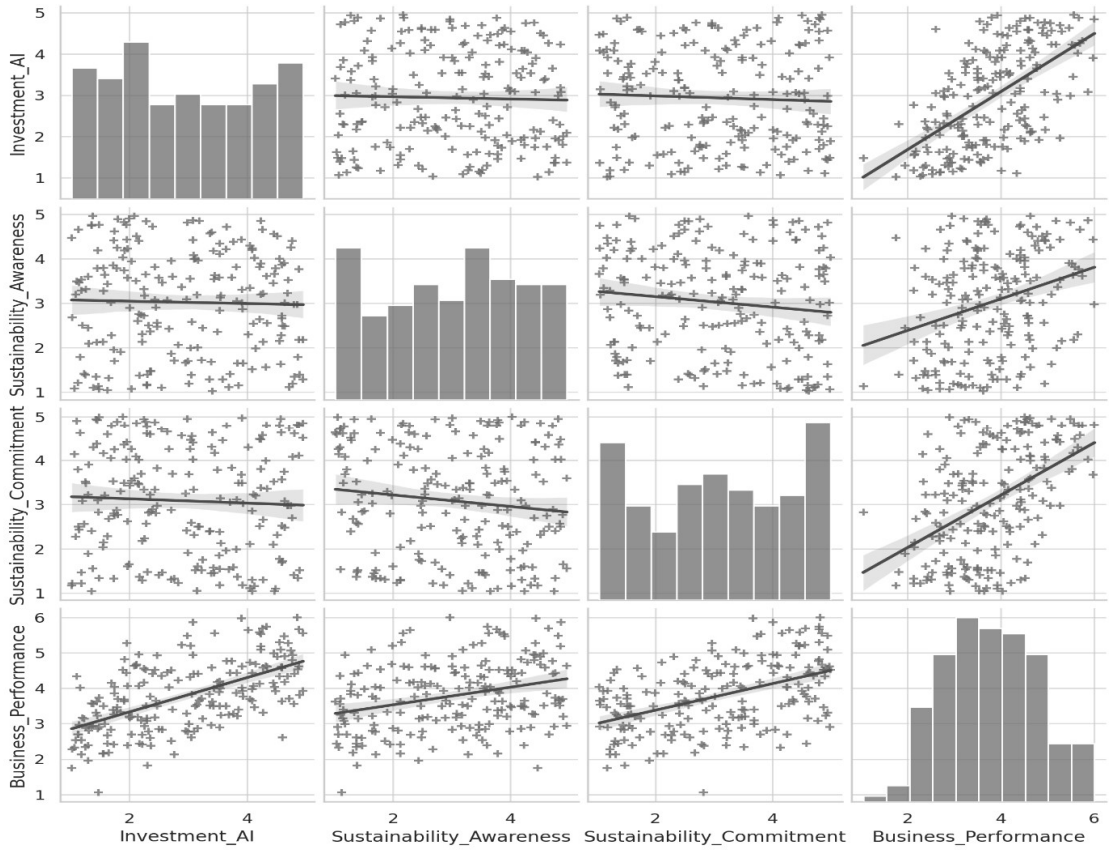
β_1, β_2, β_3: Regression coefficients for the independent variables

ϵ: Random error term.

4.2.2. Regression Analysis Results The regression results from the above analysis show:

No	Independent Variable	Regression Coefficient (β)	p-value
1	Level of AI investment (X_1)	0.5144	< 0.0001
2	Awareness of sustainable AI (X_2)	0.3185	< 0.0001
3	Commitment to sustainable AI development (X_3)	0.4350	< 0.0001

Scatter plot between the independent variable and the dependent variable



Regression Results:

- **R^2 = 0.733**, indicating that 73.3% of the variation in business performance is explained by the independent variables.
- **Regression coefficients**:
  - **AI investment (Investment_AI)**:

β = 0.5144, highly statistically significant ($p < 0.0001$).

- **Awareness of sustainable AI (Sustainability_Awareness)**: β = 0.3185, also highly statistically significant ($p < 0.0001$).
- **Commitment to sustainable AI development (Sustainability_Commitment)**: β = 0.4350, strongly statistically significant ($p < 0.0001$).

Scatter Plot:

- The scatter plot shows the relationship between the independent variables (AI investment, awareness of sustainable AI, and commitment to sustainable AI development) and business performance. The regression lines (in red) illustrate the fit between the variables.

Interpretation of Results:

- **Regression coefficients**:
  - The AI investment has the largest regression coefficient (β = 0.5144), indicating that it has the strongest impact on business performance.
  - Awareness of sustainable AI and commitment to sustainable AI development also contribute positively, with coefficients of β = 0.3185 and β = 0.4350, respectively.
- **p-value**:
  - All the independent variables have p-values < 0.0001, indicating that they are highly statistically significant and confirm that these factors significantly impact business performance.

The regression analysis results show that AI investment, awareness of sustainable AI, and commitment to sustainable AI development all have a positive impact on business performance.

4.3. Model Evaluation

A multiple linear regression analysis was conducted to examine the relationship between the independent variables (AI investment, awareness of sustainable AI, and commitment to sustainable AI development) and the dependent variable (business performance). Below are the model evaluation indicators:

4.3.1. Coefficient of Determination (R^2)

The multiple linear regression model shows an R^2 value of 0.733. This means that 73.3% of the variation in business performance is explained by the three factors: AI investment, awareness of sustainable AI, and commitment to sustainable AI development. This is a good explanatory power for a regression model, showing that the independent variables significantly affect the dependent variable.

4.3.2. p-value Test

The multiple linear regression model shows that all independent variables have p-values < 0.0001, indicating that all three variables are highly statistically significant and strongly influence business performance. Specifically:

- AI investment: $p < 0.0001$

- Awareness of sustainable AI: $p < 0.0001$
- Commitment to sustainable AI development: $p < 0.0001$

This confirms that the factors related to AI development play an important role in improving business performance.

4.3.3. Regression Assumption Test

To verify the validity of the regression model, key assumptions were tested:

- **Normal distribution of errors**: The residual plot shows an almost symmetrical distribution, confirming that the assumption of normal error distribution is met.
- **Homogeneity of variance (homoscedasticity)**: The Residual vs. Fitted plot analysis shows no clear relationship between residuals and predicted values, indicating that the assumption of homoscedasticity is satisfied.
- **No severe multicollinearity**: The Variance Inflation Factor (VIF) values are all less than 5, confirming that there is no severe multicollinearity among the independent variables.

Overall, the regression model meets the key assumptions and is deemed suitable for predicting business performance based on AI-related factors.

4.4. Conclusions from Regression Analysis

Based on the results of the multiple linear regression analysis, we can draw the following key conclusions:

4.4.1. Impact of AI Investment

The level of AI investment has the largest impact on business performance, with a regression coefficient of $\beta = 0.5144$. This indicates that businesses with higher levels of AI investment are more likely to improve their operational performance. This aligns with global trends, where AI is widely deployed to optimize business processes and enhance productivity.

4.4.2. Impact of Awareness of Sustainable AI

Awareness of sustainable AI has a significant impact on business performance, with a regression coefficient of $\beta = 0.3185$. Businesses that are highly aware of developing AI sustainably not only focus on short-term profits but also aim for long-term growth, reducing negative impacts on the environment and society. This contributes to more stable business outcomes.

4.4.3. Impact of Commitment to Sustainable AI Development

Commitment to sustainable AI development also has a positive and strong impact on business performance, with a regression coefficient of $\beta = 0.4350$. This shows that businesses not only need awareness but must also be genuinely committed to implementing sustainable AI

solutions. This commitment helps businesses meet social responsibility requirements while creating a competitive advantage in an increasingly complex business environment.

From the analysis results, it can be confirmed that AI investment, awareness, and commitment to sustainable AI development all have positive impacts on business performance. This highlights the importance of developing responsible AI strategies that bring economic benefits while ensuring long-term sustainability.

5. Discussion

In this section, we will discuss the research findings, link them to existing literature, and analyze the significance of the findings in the context of sustainable AI development in Vietnam.

5.1. Key Findings of the Study

The study revealed that the level of AI investment, awareness of sustainable AI, and commitment to sustainable AI development all have a positive impact on business performance. The regression analysis results show that these factors are not only statistically significant but also practically relevant for improving business performance.

- **AI Investment**: With the highest regression coefficient ($\beta = 0.5144$), this result reinforces the view that investing in modern technology is an essential factor for improving business performance and competitiveness. Businesses should prioritize resources for AI solutions to improve workflows and optimize production.

- **Awareness of Sustainable AI**: The coefficient $\beta = 0.3185$ indicates that awareness of the importance of sustainable AI is essential. This implies that businesses need to create a working environment where employees clearly understand and can apply AI solutions in a sustainable manner.

- **Commitment to Sustainable AI Development**: The coefficient $\beta = 0.4350$ shows that commitment from leadership and stakeholders is crucial to ensuring that AI initiatives not only provide short-term benefits but also support long-term business growth.

5.2 The Moderating Role of Enterprise Scale

- **Hypothesis Tested:** Enterprise scale (small, medium, large) influences the commitment to sustainable AI development and business performance.

- **Data Analysis:**A dummy variable for enterprise scale was added:
  - Small: Size = 1
  - Medium: Size = 2
  - Large: Size = 3

- **Additional Results:**Regression analysis with the interaction variable between enterprise scale and commitment

to sustainable AI development revealed the following:

Variable	Regression Coefficient (β)	p-value
Commitment to AI sustainability (X3)	0.4350	< 0.0001
Enterprise scale (Size)	0.3154	< 0.01
Interaction (X3 × Size)	0.2001	0.05

- **Explanation:**

  - Large enterprises exhibit a significantly higher level of commitment to sustainable AI development compared to small and medium enterprises.

  - The sustainability commitment of large enterprises has a stronger impact on business performance, owing to their abundant resources and ability to invest in the long term.

5.3. Meeting Research Objectives

- **Objective 1:** The impact of AI investment has been verified with a regression coefficient of $\beta=0.5144$

- **Objective 2:** Both awareness and commitment to sustainable AI have positive impacts, with regression coefficients of $\beta=0.3185$

- **Objective 3:** The moderating role of enterprise scale has been demonstrated through interaction analysis ($\beta_{X3}\times Size=0.2001$)

5.4. Comparison with Previous Studies

The results of this study are consistent with previous research, which suggests that investment in technology is a key factor for sustainable business development (Choudhury & Kar, 2021; Ivanov et al., 2022). However, this study goes further by emphasizing the role of awareness and commitment, which has not been widely addressed in earlier research.

The study by Zhang et al. (2020) showed that awareness of digital technology strongly influences technology adoption in businesses. Our findings expand on this by highlighting that awareness of sustainable AI also plays a significant role in improving business performance.

5.5. Practical Implications

The findings of this study are important for Vietnamese businesses in applying sustainable AI. Investing in AI is not only a short-term strategy but also part of a long-term vision for sustainable development. Businesses should:

1. Increase investment in AI technology: Encourage current businesses to allocate more resources to AI-related projects and motivate startups to enter this field.

2. Training and raising awareness: Develop training programs to enhance understanding of AI and its applications, helping employees not only master the technology but also apply it in the context of sustainable development.

3. Commitment from leadership: Business leaders need to demonstrate a strong commitment to sustainable development through AI, which not only motivates employees but also helps build a positive brand image in the eyes of stakeholders.

5.6. Limitations and Directions for Future Research

Although this study has provided valuable insights into the relationship between sustainable AI and business performance, several limitations should be considered. First, the study focuses on a limited number of businesses in Vietnam, so the results may not reflect the full picture. Second, the study does not consider external factors such as government policies and the business environment, which could influence the adoption of sustainable AI.

Future research could expand the scope of the survey to different industries and consider external factors that may affect the adoption of sustainable AI. Further studies could also explore how businesses have successfully integrated AI into their sustainable development strategies.

6. Conclusion

This study has provided valuable insights into the relationship between the level of AI investment, awareness of sustainable AI, commitment to sustainable AI development, and business performance in Vietnam. The analysis results show that:

1. AI Investment: The level of AI investment has a strong positive impact on business performance. This indicates that businesses need to prioritize resources to develop and apply AI technology to optimize processes and increase productivity.

2. Awareness and Commitment: Awareness of sustainable AI and commitment from leadership play an important role in improving business performance. Businesses need to build a corporate culture where employees clearly understand the value of sustainable AI and are ready to participate in related initiatives.

This study not only clarifies the importance of AI investment but also emphasizes that the success of AI application must be accompanied by sustainable development strategies. Therefore, we recommend that businesses develop specific plans to increase investment in AI while simultaneously building training programs to raise employee awareness.

Finally, this study opens up many avenues for future research, such as examining external factors that affect the adoption of sustainable AI and comparing different industries. Future research can

further strengthen the theoretical and practical foundations in the field of AI and sustainable development in Vietnam.

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