Impact of Artificial Intelligence on Strategic Management Towards Sustainability: Perspective to Bangladesh

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ABSTRACT

Artificial intelligence is reshaping sustainable strategic management globally, and its impact on the environment, society, and economy is increasingly significant. This article discusses the key role of AI in promoting the sustainable development of enterprises through the analysis of multiple research cases and literature. Research shows that AI can not only improve operational efficiency, but also achieve significant environmental improvement by optimizing the use of renewable energy, reducing emissions, enhancing workplace safety, promoting diversity, and supporting community initiatives. In addition, AI plays an important role in internal changes in enterprises, further improving the sustainability performance of enterprises by promoting organizational flexibility and process optimization. The study also found that the application of AI technology needs to consider ethical and security issues to ensure that it has a positive impact on society and the environment in Bangladesh. This paper provides a blueprint for other regions and industries in Bangladesh to harness technology for greater sustainability and provides theoretical foundations and practical guidance for managers in strategy and policy development.

INTRODUCTION

Artificial intelligence has emerged as a major driver of the transformation of strategic management towards sustainability in today's rapidly evolving business environment. As environmental protection, social responsibility, and economic sustainability gain more attention globally, the use of AI in enterprise strategic management becomes more and more significant. This article will examine the effects of AI on strategic management, particularly in the context of attaining sustainable development goals.

By streamlining production, decreasing environmental impact, increasing productivity, and bolstering social responsibility, artificial intelligence (AI) technology opens up new avenues for businesses to meet sustainable development goals(Zavrazhnyi 2024). AI can optimize the supply chain by assessing industrial processes and predicting raw material demands, thereby reducing energy usage and minimizing the environmental footprint(Zavrazhnyi 2024). Furthermore, the use of AI in environmental management, social responsibility, and corporate governance demonstrates its potential to optimize resource use, minimize carbon emissions, increase fairness in recruiting, and avoid fraud(Zhao. 2024).

Through process optimization and organizational flexibility, AI is being used in strategic management to improve not only operational efficiency but also the sustainability performance of businesses(Khan 2024). Research has demonstrated that the degree of AI adoption greatly enhances businesses' sustainability performance, and that organizational change acts as a mediator between AI adoption and sustainability performance(Li. and Jin 2024). This indicates that in order to fully accomplish sustainable development goals,

businesses promoting the use of AI need not only concentrate on technological adoption but also on internal organizational change and the development of digital competencies(Li. and Jin 2024).

Additionally, the sustainable growth of businesses is significantly impacted by the strategic integration of AI in data management and user interaction. AI-driven data analysis can enhance decision-making procedures, resource optimization, and overall operational efficiency through effective data collection, analysis, and use, supporting sustainable practices in the process(Jankovic 2023). Personalized services powered by AI and multi-channel interactions also greatly improve user experience, contentment, and loyalty, which eventually fosters long-term company growth(Jankovic 2023).

However, AI confronts numerous hurdles in fostering sustainable development, including technical complexity, high prices, data privacy and ethical issues, and organizational and cultural opposition(Zhao. 2024). Businesses must implement strategic solutions including open-source tools, technology collaborations, and employee training to overcome these obstacles and guarantee the responsible application of AI while optimizing its beneficial effects on the environment and society(Zhao. 2024).

To summarize, the use of artificial intelligence in strategic management is immensely transforming the operational and management modes of businesses, propelling them toward more sustainable growth. Enterprises that use AI technology intelligently can not only enhance economic efficiency, but also make substantial advances in environmental protection and social responsibility. Future study should look into the potential applications of AI in many industries and suggest effective solutions to handle any issues that may occur during implementation.

Literature Theory

When exploring the theoretical literature on the impact of artificial intelligence on strategic management towards sustainability, it can be analyzed from multiple perspectives. For starters, incorporating AI into company strategic management not only enhances operational efficiency but also encourages environmental and social responsibility. For example, AI gives new options for organizations to meet sustainable development goals by optimizing production processes, minimizing environmental impact, increasing efficiency, and boosting social responsibility(Zavrazhnyi 2024).

AI has made several contributions to aiding sustainable development. From the perspective of organization, technology, and process, AI delivers strong capabilities for organizations by increasing decision support, optimizing supply chains, lowering energy use, and recognizing possible sustainability issues(Kulkov, Kulkova et al. 2023). Furthermore, AI plays a crucial role in increasing resource usage efficiency, minimizing waste, and supporting environmental protection and monitoring(Pankaj Kumar Tyagi; Priya Sharma; Ajit Kumar Singh; Priyanka Tyagi; Parikshit Sharma; Vikram Jit Singh 2023).

Artificial Intelligence (AI) in strategic management also includes process optimization and organizational flexibility, both of which support long-term business growth. Research has indicated that the correlation between artificial intelligence and process optimization may have an indirect impact on the long-term viability of businesses, whereas organizational adaptability serves a regulatory function(Khan 2024). This implies that when businesses embrace AI technology, they must think about how to successfully integrate these technologies in order to meet their strategic objectives.

AI has the potential to advance sustainability, but there are drawbacks as well. For instance, concerns like data privacy and employment loss must be appropriately handled(Pankaj Kumar Tyagi; Priya Sharma; Ajit Kumar Singh; Priyanka Tyagi; Parikshit Sharma; Vikram Jit Singh 2023). Furthermore, while AI holds immense promise for environmental monitoring and preservation, its implementation is still beset by a lack of research and legislative backing(Kamakshi Rautela 2020, Manish Yadav 2023).

Sustainability is significantly impacted by the use of AI in strategic management. AI gives businesses new options to attain sustainable development by streamlining manufacturing processes, increasing resource efficiency, and lessening their impact on the environment. However, businesses must overcome ethical, legal, and technical obstacles to guarantee the appropriate and efficient use of AI if they are to fully realize its

potential(Vinima Gambhir 2022, Li. 2023).

Research Objectives: The goal of the research questionnaire is to explore the impact of artificial intelligence on strategic management in terms of sustainability. The following are detailed research goals:

(1) Assessing the role of AI in the sustainability performance of enterprises: Assessing how widely AI is being used in businesses and looking at how it contributes overall to the financial, environmental, and social advantages of businesses.

(2) Analysis of the mediating role of organizational change in the relationship between AI and sustainability performance: Examine how organizational change functions as a mediating variable between the adoption of AI and sustainability results, and investigate how this mediating effect is regulated by both internal and external environmental factors.

(3) Identify the use of AI in different industries and its impact on sustainability: Use text mining tools to examine sustainability reports from Bangladeshi companies in order to comprehend particular uses of AI for enhancing operational effectiveness, cutting emissions, and supporting community projects.

(4) Systematic assessment of the contribution of AI to advancing the global Sustainable Development Goals (SDGs): Analyze the organizational, technological, and processing contributions of AI through a study of contributions, and then suggest a conceptual model to help organizations incorporate AI by highlighting important factors.

(5) Study of the potential of artificial intelligence in improving the efficiency of production processes and reducing environmental impact: In order to determine successful tactics, compile the results of using artificial intelligence to improve social responsibility, lower energy consumption, and optimize manufacturing processes.

(6) Explores the relationship between AI and process optimization in organizational flexibility and sustainability performance: Use the resource-based viewpoint (RBV) hypothesis to investigate how AI might promote sustainable growth through process outsourcing and organizational agility.

(7) Strategic Framework for Implementing Artificial Intelligence in Achieving Sustainable Development Goals (SDGs): Provide a strategy framework for AI in developing nations or areas, like Bangladesh, to lessen its negative effects and encourage its beneficial applications in a range of industries.

(8) A systematic review of the relationship between AI and sustainability in information systems: Through a thorough analysis of the literature, we investigate how AI may aid in decision-making and advance social, economic, and environmental development. We also suggest a research agenda for the future.

(9) Identify key research trends and relationships between AI and sustainability in business management: Assess the connection between AI and sustainability using tools for literature measurement analysis, and find new areas and trends for further study.

By offering theoretical underpinnings and useful advice for business managers, these study goals seek to completely comprehend how AI affects sustainability in strategic management.

Variable Definition and Measurement

- Dependent variable: Sustainability performance, including environmental, social and economic dimensions of performance indicators.

-Self-variables: the intensity of AI adoption and areas of application (e.g. production optimization, resource management, waste disposal, etc.).

- Intermediary variables: organizational change and process optimization.

- Regulatory variable: organizational flexibility.

Hypothesis: To support the whole research process and to come to a final decision, few hypothesis are developed. The developed hypothesis are stated bellow:

H1: The intensity of AI adoption positively affects the sustainability performance of enterprises.

Supporting evidence shows that AI plays a significant role in optimizing production processes, reducing environmental impact, and improving productivity.

H2: Organizational change acts as an intermediary between AI and sustainability performance.

- Supporting evidence shows that organizational change is a key mediating variable for AI to enhance corporate sustainability performance.

H3: Organizational flexibility regulates the relationship between AI and sustainability performance.

- Supporting evidence shows that enterprises with high organizational flexibility can more effectively utilize AI technology to achieve sustainable development goals.

H4: Applications of artificial intelligence in environmental management, resource optimization, and waste disposal have a significant positive impact on sustainability performance.

- Supporting evidence shows that AI plays an important role in resource efficiency, environmental monitoring, and carbon emissions reduction.

H5: The ethical use of AI is critical to the positive impact on society and the environment.

- The supporting evidence emphasizes the ethical and social responsibility issues that AI needs to consider when promoting sustainable development.

Through the above research design and hypothesis, this study aims to explore in depth the application of AI in strategic management and its path to achieving sustainability goals, providing theoretical basis and practical guidance for enterprise managers.

METHODOLOGY

This study aims to explore the impact of artificial intelligence on strategic management in terms of sustainability. The study will use a mixed-methods approach, combining quantitative and qualitative analysis, to comprehensively assess the application of AI in different industries and organizations and its impact on sustainability goals. This study offers different type of information compared with the past investigation on the state of affairs in the aforementioned country. While prior studies in this field are adequate, several of them lack comprehensive reviews.

In particular, it makes use of PLS-SEM, a causality-predictive technique formulated to anticipate and illustrate the correlations between variables in statistical models. The study applies the bootstrapping technique with 5000 replications to take into consideration the bias, shape, and spread of the population's testing distribution. The investigation's purpose of generating and assessing a theoretical model is what motivated the selection of PLS-SEM. As explained in, PLS-SEM is favored for covariance-based SEM (CBSEM) because of its potential to deal with challenges concerning multivariate normality, sample size, measurement level, model complexity, and variable uncertainty.

Research framework:

-Theoretical Basis: Based on the Resource-Based viewpoints (RBV) theory, this paper discusses how AI can improve the sustainability performance of enterprises by optimizing processes, improving organizational flexibility, and enhancing social responsibility.

-Methodological Basis: Data analysis was conducted using structural equation modeling (SEM) and partial least

squares-structural equation modeling (PLS-SEM) to validate the hypotheses and assess the impact of AI on sustainability performance.
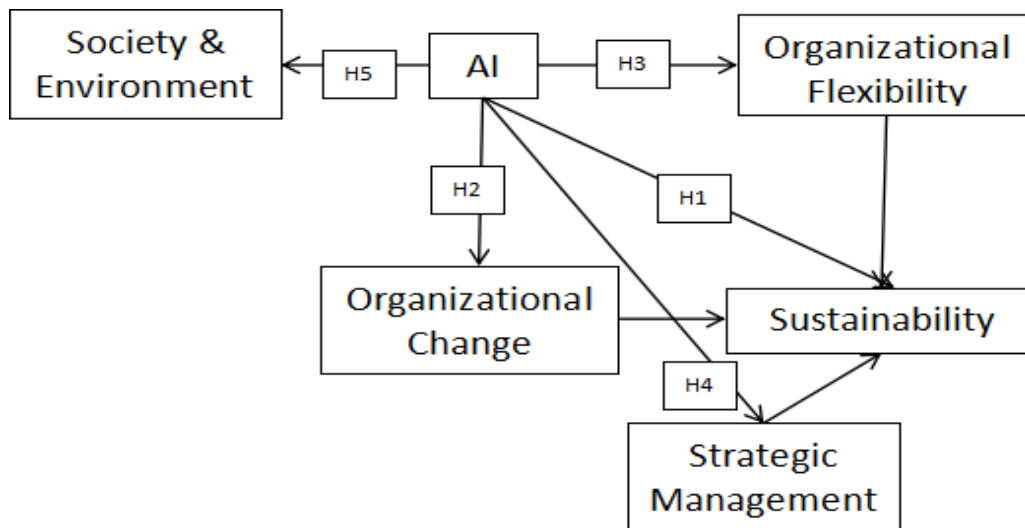

Fig 1: Research Model

In exploring the research methodology for the impact of AI on strategic management in terms of sustainability, the following steps has been taken:

(1) Literature review and theoretical framework construction:

- First, collect and analyze relevant studies through systematic literature reviews. For example, consider existing research on the relationship between AI and the Sustainable Development Goals (SDGs)(Kulkov, Kulkova et al. 2023) and the impact of AI in corporate sustainability strategies(Li. 2023).

- Establish a theoretical framework that links the application of AI to different dimensions of sustainable development, such as the environment, society and economy. This can be achieved by incorporating Resource-Based Viewpoints (RBV) theory to explore how AI can contribute to sustainable growth by optimizing processes and increasing organizational flexibility(Khan 2024).

(2) Qualitative and quantitative research methods:

- Qualitative analytical methods, such as case studies and text mining techniques has been to gain insights into the use of AI in different industries and its impact on sustainability. The study reveals how AI can be used to optimize operational efficiency and environmental improvements by analyzing sustainability reports from Bangladeshi companies(Balcıoğlu 2024).

- Quantitative analysis methods such as structural equation modeling (SEM) or smart PLS has been combined to validate the relationship between AI and sustainability performance and explore mediating and moderating effects. This approach is used to examine how the intensity of AI adoption affects the sustainability performance of a business through organizational change(Li. and Jin 2024).

(3) Multidimensional Assessment and Indicator System:

- A comprehensive set of sustainability criteria and indicators has been developed to comprehensively assess the sustainability impact of AI systems(Rohde, Wagner et al. 2023).

- The role of AI in strategic leadership and its contribution to the Sustainable Development Goals, incorporating environmental, social and governance (ESG) considerations is intended to be evaluated (Sklavos, Theodossiou et al. 2024).

(4) Field research and data collection:

- For this study, field research and collect internal data and employee feedback is conducted to understand the application of AI in practice and its impact on sustainability goals. For example, data has been collected through employee surveys to analyze the relationship between the intensity of AI adoption and corporate sustainability performance(Li. and Jin 2024). For this study, data has been collected through online surveys and corporate reports covering companies in different industries and regions in Bangladesh, such as Dhaka, Chittagong, Rajshahi, Khulna, Barishal, Sylhet, Mymenshingh and Rangpur. Samples are selected from companies from a representative range of manufacturing, energy, and transportation industries as subjects to ensure diversity and broadness of the sample.

- Mixed methodological studies combined with quantitative data analysis and qualitative case studies has been used to comprehensively assess the effectiveness of AI applications in areas such as natural resource management, agriculture and waste management(Jones, Harris et al. 2024).

(5) Ethics and Risk Management:

- In the course of research, special attention is paid to the ethical issues and potential risks of AI applications. For example, when assessing the use of AI in environmental protection, consideration needs has been given to its carbon footprint and potentially exacerbated social inequalities(Camaréna 2021).

- How challenges such as high initial costs and data privacy can be overcome through policy support and infrastructure development is explored to maximize the benefits of AI in sustainable development(Jones, Harris et al. 2024).

Through the above methods, it is possible to systematically study the impact of AI on strategic management in terms of sustainability and provide theoretical foundations and practical guidance for business managers.

RESULTS

In this study, PLS-SEM algorithm function is used to obtain the R2 values, while the smart PLS bootstrapping function is used to generate the t-statistic values and for this study, it generated 5000 samples from the surveys. As presented in Figure2, the analysis of R2 revealed that 81.7% of variance in society and environment (SEnv) was explained by AI, 44.4% of variance in organizational flexibility (OgFlx) was explained by AI, while 82.8% of variance in organizational Change (OgCng) was explained by AI. On the other hand, 83.2% of variance in Strategic Management(SM) was explained by AI. Thus, the findings of the structural model support and are in line with recent literature that emphasized connective core principles and relations. The results estimated using PLS-SEM for the structural model are displayed in Figure2 and R2 values of the structural model are presented in table 1.
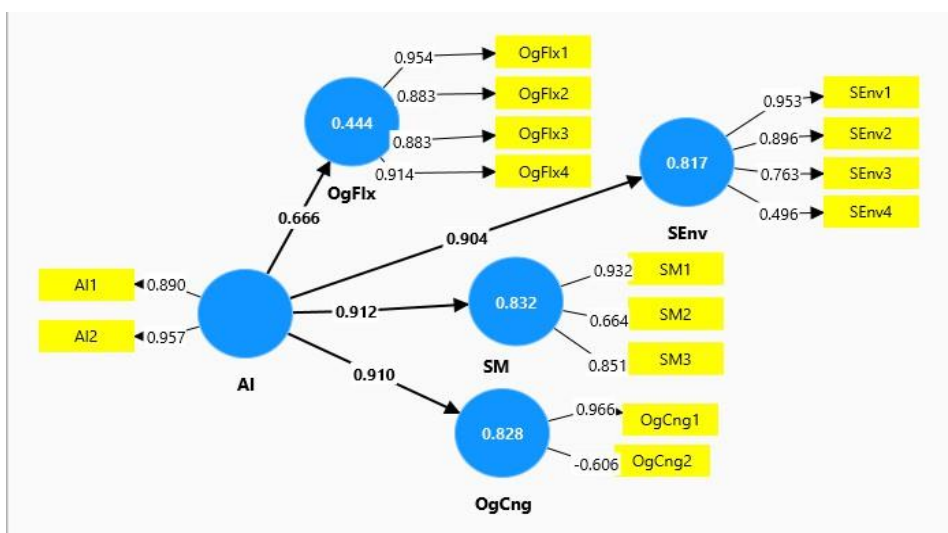

Fig 2: Structural Model

Bootstrapping was used to estimate relevant characteristics of the population. The sampling distribution of a statistic is constructed empirically by resampling from the sample. The resampling procedure is designed to parallel the process by which sample observations were drawn from the population. Bootstrapping result is shown in fig 3.
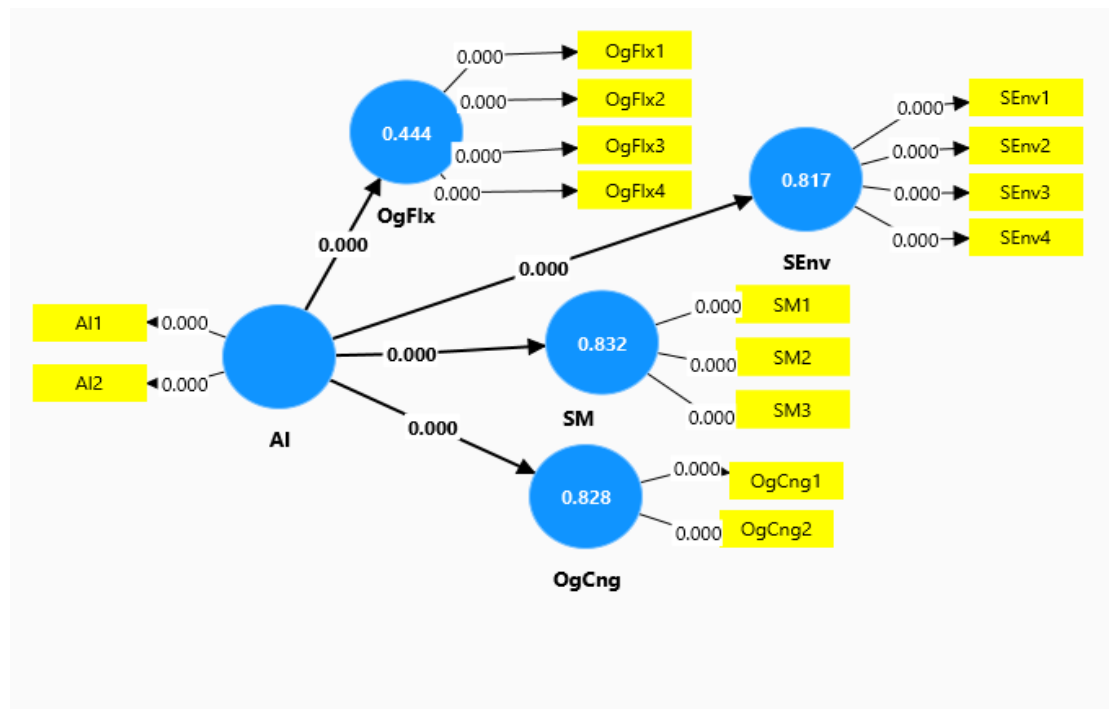

Fig 3: Bootstrapping Result

The R-square value in table 1 indicates the amount of variance in dependent variables that is explained by the independent variables.

	R-square	R-square adjusted
OgCng	0.828	0.823
OgFlx	0.444	0.429
SEnv	0.817	0.812
SM	0.832	0.828

Table 1: R-square Overview

In summary, the first criterion in evaluating the structural model has been satisfied by determining the R2 values for all endogenous constructs. All dependent constructs have recorded strong R2 values overall and in fact, it can be seen that from the table that diversity has the strongest R2 values among other constructs when the construct is explained 83% by all other constructs in the model. The next section describes the analysis to test the second criterion which is to determine the significance of the path coefficient by employing the bootstrapping procedure.

Before the hypothesis path coefficients are examined, the study performed the analysis of correlation among the latent variables. table 2(a) lists down the correlation coefficient among the latent variables. The analysis of correlation among hypothesis latent variables indicates that there were a significant correlation among all the latent variables in structural model

	OgCng	OgFlx	SEnv	SM
AI	0.910	0.666	0.904	0.912

OgCng				
OgFlx				
SEnv				
SM				

Table 2(a): Path Coefficient (Matrix)

	Original sample (O)	Sample mean (M)	Standard deviation (STDEV)	T statistics (|O/STDEV|)	P values
AI -> OgCng	0.910	0.916	0.017	52.231	0.000
AI -> OgFlx	0.666	0.678	0.043	15.583	0.000
AI -> SEnv	0.904	0.913	0.011	85.306	0.000
AI -> SM	0.912	0.916	0.012	73.240	0.000

Note: All the coefficient correlations are significant at 5% level.

Table 2(b): Path Coefficients- Mean, STDEV, T-Values, P-Values

The relationship between latent variables and all the hypothesized path were examined through its path-coefficient, t-statistic, and p value that were shown in table 2(b). The hypothesized relationships were accepted or rejected, and characterized as weak or strong based on the algebraic signs, magnitudes, and statistical significance of the corresponding path coefficients. A path coefficient's magnitude indicates the strength of the relationship between the variables. The resulting p values were interpreted as follows: (i) $p<0.05$ indicates a statistically significant relationship; (ii) $p<0.01$ indicates highly statistically significant relationship; and (iii) $p < 0.001$ indicates very highly statistically significant relationship.

As shown in table 2(b), the study revealed that AI has positive significant effect on SEnv and OgFlx. On the other hand, AI has a positive significant effect on OgCng, and SM. In summary, all the latent variables are strongly correlated and hence showed the positive significant effect on the corresponding latent.

Data Analysis: The influence of artificial intelligence on strategic management in terms of sustainability is a complex and multidimensional issue. Through the analysis of existing evidence, we can explore from multiple angles how AI affects the strategic management of enterprises and its role in achieving sustainable development goals(Hasan, Shamael et al.)

AI has great potential in optimizing production processes, reducing environmental impact, improving productivity, and strengthening social responsibility. Research shows that AI can achieve these goals by analyzing production processes, predicting raw material needs, optimizing supply chains, and reducing energy consumption(Zavrazhnyi 2024). In addition, AI can identify defects in production in real time and control product quality, thereby improving the competitiveness and sustainable development capabilities of enterprises(Zavrazhnyi 2024).

The application of AI in enterprise strategic management is not limited to internal operation optimization, but also includes promoting sustainable business growth through data management and user participation. For example, AI-driven data analysis can improve decision-making processes, resource optimization, and overall operational efficiency, while personalized services and multi-channel interactions significantly enhance user experience and loyalty(Jankovic 2023). Together, these factors promote the sustainable development of the enterprise.

Third, the integration of AI in environmental, social, and governance (ESG) practices also presents new opportunities and challenges for enterprises. The application of AI technology in environmental management,

social responsibility, and corporate governance can help optimize resource allocation, reduce carbon emissions, improve fairness in recruitment, and prevent fraud(Zhao. 2024). However, the integration of AI and ESG faces challenges such as technical complexity, high costs, data privacy, and ethical issues, which need to be addressed through strategies such as technology cooperation, open-source tools, and employee training(Zhao. 2024).

In addition, the application of AI in enterprise strategy also involves the mediating role of organizational change and flexibility. The study found that the intensity of AI adoption has a possibility to significantly improve the sustainability performance of enterprises, and organizational change in Bangladesh which played a key mediating role between AI adoption and sustainability performance(Li. and Jin 2024). This means that when promoting AI applications, enterprises should not only focus on the adoption of technology, but also pay attention to internal organizational changes and the development of digital capabilities.

The application of AI in strategic management also faces some potential negative effects, such as high energy consumption and ethical issues. Although AI has a positive impact on resource utilization efficiency and environmental monitoring, its energy consumption may have negative effects(Burki, Mafaz et al. 2024). Therefore, policymakers should promote AI applications in resource efficiency and environmental monitoring through incentives such as tax breaks or subsidies, and invest in renewable energy infrastructure to reduce AI's energy consumption(Burki, Mafaz et al. 2024).

The application of AI in strategic management has a profound impact on sustainability. Through optimizing production processes, improving data management capabilities, integrating ESG practices, and driving organizational change, AI provides strong support for enterprises to achieve sustainable development goals. However, in order to fully realize the potential of AI, enterprises need to overcome challenges such as technical complexity, high costs, and ethical issues, and develop corresponding strategic solutions.

Impacts of AI: The impact of artificial intelligence on strategic management, especially in terms of sustainability, is a complex and multidimensional issue. In the context of Bangladesh, the application of AI not only affects economic and social development, but also has a profound impact on the environment.

AI plays an important role in the sustainable development of Bangladesh. Research shows that AI has significant applications in agriculture, waste sorting, intelligent water management, and HVAC systems, among other areas, which can help achieve the Sustainable Development Goals (SDGs)(Hasan, Shamael et al. 2023). In addition, AI technology brings positive changes to business operations by improving production efficiency, reducing costs, and increasing accuracy(Sarker, Khan et al. 2024). However, the integration of AI also faces some challenges, such as infrastructure constraints, skills shortages, ethical issues, and financial constraints(Sikder. 2023).

At the enterprise level, the application of AI is considered a strategic resource that can improve sustainability performance by optimizing processes and increasing organizational flexibility(Khan 2024). However, enterprises also need to pay attention to data privacy and security issues when implementing AI, and address employment replacement issues through training and policy support(Sarker, Khan et al. 2024).

In addition, the macroeconomic impact of AI in Bangladesh cannot be ignored. Although AI has the potential to improve productivity and economic growth, Bangladesh has not yet fully realized these expected benefits(Sarker 2022). Therefore, the government needs to take more measures, such as increasing the use of AI robots and improving infrastructure, to fully realize the potential of AI(Sarker 2022).

The application of artificial intelligence in strategic management has had a profound impact on sustainability perspective to Bangladesh, not only improving operational efficiency and resource utilization efficiency, but also promoting environmental protection and social responsibility. However, businesses also need to be aware of potential challenges and ethical issues when adopting AI technology to ensure their positive contribution to achieving sustainable development goals.

CONCLUSION

The application of artificial intelligence in strategic management has a profound impact on sustainability. By analyzing the available literature and research, the following conclusions can be drawn:

1. Operational Efficiency Improvement and Environmental Improvement: The application of AI in enterprises not only improves operational efficiency but also significantly improves environmental performance. For example, AI is used to optimize the use of renewable energy and reduce emissions, thereby promoting sustainable development of the environment. In addition, AI further promotes the environmental sustainability of enterprises by optimizing production processes, reducing energy consumption, and improving resource utilization efficiency.

2. Promote social responsibility and community participation: The application of AI is not limited to improving economic benefits, but also enhances the sense of social responsibility of enterprises. AI technology is used to enhance workplace safety, promote diversity, and support community initiatives. This indicates that AI plays an important role in promoting corporate social responsibility.

3. Promoting organizational change and flexibility: The introduction of AI has prompted organizations to undergo internal changes to adapt to new business models and strategies. Research shows that organizational change mediates the relationship between AI and sustainability performance, and organizational flexibility further moderates this relationship. This means that enterprises need to pay attention to internal changes and the development of digital capabilities when adopting AI.

4. Supporting Policy Formulation and Global Goal Achievement: AI also shows great potential in policy formulation by improving the policy-making process through decision support and optimization technologies. In addition, the application of AI can help achieve the Sustainable Development Goals (SDGs), especially in areas such as resource management, climate change mitigation, and biodiversity conservation.

5. Challenges and Ethical Considerations: Although AI has great potential for sustainability, there are also challenges and ethical issues such as data privacy, job replacement, and high energy consumption. Therefore, enterprises need to be cautious when adopting AI and ensure that their applications comply with ethical standards and sustainable development requirements.

The application of AI in strategic management has a positive impact on sustainability, but it also requires attention to its potential negative effects. Future research should continue to explore how to balance the pros and cons of AI to ensure its maximum benefits in promoting sustainable development.

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