The Role of Artificial Intelligence in Enhancing Sustainability in Educational Organizations

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Abstract.

Educational organizations increasingly faced sustainability challenges driven by economic uncertainty, environmental pressures, and rapid technological change. Artificial intelligence (AI) emerged as a practical tool that supported educational organizations in improving operational efficiency, strengthening decision-making, and enhancing long-term sustainability, even under resource constraints. This study examined the role of artificial intelligence in enhancing the sustainability of educational organizations in Thailand. A quantitative research approach was adopted, with survey data collected from 400 administrators and staff working in educational organizations. Descriptive statistics and exploratory factor analysis were employed to identify key artificial intelligence-related variables, while multiple regression analysis was used to examine the influence of artificial intelligence on sustainability performance. The results indicated a significant positive relationship between artificial intelligence adoption and sustainability across economic, environmental, and social dimensions. AI-related capabilities, particularly data-driven decision support, process automation, and intelligent information management, were found to enhance operational efficiency and organizational resilience. The findings highlighted artificial intelligence as a strategic enabler of sustainability in educational organizations and provided practical insights for administrators and policymakers seeking to support sustainable development within the education sector.

Keywords: Artificial Intelligence, Sustainability, Educational Organizations

1. Introduction

Educational organizations played a fundamental role in national development by producing human capital, advancing knowledge, and supporting social and economic progress. In Thailand, educational organizations, particularly higher education institutions, represented a large and complex system serving millions of students and employing a substantial number of academic and administrative personnel. National education statistics indicated that Thailand had more than 150 higher education institutions, with total student enrollment exceeding two million nationwide. These organizations therefore exerted significant social, economic, and environmental impacts through their operations, infrastructure, and service delivery. Beyond their core educational mission, educational organizations were increasingly expected to operate responsibly by responding to stakeholder expectations and contributing to national and global sustainability agendas. Despite their importance, educational organizations in Thailand continued to face structural challenges that affected their long-term sustainability. Limited financial resources, rising operational costs, and increasing demand for educational quality placed considerable pressure on institutional management. In addition, constraints related to

technological readiness, data utilization, and managerial capacity often limit the ability of educational organizations to adapt efficiently to a rapidly changing environment. As expectations for accountability, efficiency, and sustainability continued to grow, sustainability became an essential concern for educational organizations. In this context, sustainability extended beyond environmental responsibility to encompass economic viability, organizational resilience, and social contribution. Strengthening operational efficiency, improving decision-making processes, and enhancing institutional adaptability therefore were critical for the long-term sustainability of educational organizations.

Artificial intelligence emerged as a promising technological tool that could support educational organizations in addressing these sustainability challenges. AI technologies, such as data analytics, process automation, predictive analysis, and intelligent decision-support systems, enabled organizations to manage information more effectively, reduce operational inefficiencies, and improve planning and resource allocation. In educational organizations, artificial intelligence was often adopted in a practical and application-oriented manner, focusing on administrative management, academic support services, and institutional operations rather than complex or experimental systems. These characteristics suggested that artificial intelligence had the potential to enhance sustainability outcomes across economic, environmental, and social dimensions within educational organizations. Although interest in artificial intelligence and digital transformation in the education sector had increased, empirical research examining the role of artificial intelligence in enhancing sustainability within educational organizations remained limited. Existing studies frequently focused on large commercial organizations or addressed digital technologies in general, without identifying specific artificial intelligence-related factors that contributed to sustainability performance in educational settings. Moreover, empirical evidence grounded in the Thai educational context was still scarce.

Therefore, the present study examined the role of artificial intelligence in enhancing the sustainability of educational organizations in Thailand. Using survey data collected from administrators and staff in educational organizations, this study aimed to identify key artificial intelligence-related variables adopted by educational organizations and to examine their influence on sustainability performance. By providing empirical evidence from the Thai context, this study contributed to the literature on artificial intelligence and sustainability in education and offered practical insights for educational administrators and policymakers seeking to promote sustainable development within educational organizations.

1.1 Research Objective

1.1.1 To identify key AI variables adopted by educational organizations.

1.1.2 To examine the role of AI in enhancing the sustainability of educational organizations.

2. Literature review

2.1 Educational Organizations

Educational organizations play a critical role in social and economic development by producing human capital, advancing knowledge, and supporting innovation and social mobility. These organizations are often characterized by complex governance structures, diverse stakeholder groups, and service-oriented missions that extend beyond financial

performance. At the same time, educational organizations frequently face structural constraints, including limited financial resources, increasing operational costs, technological gaps, and managerial challenges, which may affect their long-term sustainability and organizational effectiveness.

Previous studies have emphasized the importance of strengthening internal capabilities, human capital, and organizational readiness to improve performance in educational and knowledge-based organizations. Phrapratanporn et al. (2019) highlighted that personnel development and capability enhancement significantly improve organizational performance and operational coordination, suggesting that internal capacity building is essential for institutional effectiveness. Similarly, Wisedsin et al. (2020) emphasized the role of advanced technology, human capital, and employee empowerment in enhancing organizational performance, indicating that technological capability and workforce readiness are critical factors in organizational competitiveness. Waiyawuththanapoom et al. (2020) and Sommanawat et al. (2021) further demonstrated that innovation plays a moderating role in the relationship between management practices and organizational performance, reinforcing the importance of adaptability and continuous improvement. Collectively, these studies suggest that educational organizations must continuously develop internal capabilities and adopt appropriate technologies to improve performance and ensure long-term viability. As educational environments become increasingly complex and resource-constrained, organizations are required to leverage digital technologies to enhance efficiency, responsiveness, and sustainability.

2.2 Artificial Intelligence (AI)

Artificial intelligence refers to a set of technologies that enable machines and systems to perform tasks that typically require human intelligence, such as learning, reasoning, pattern recognition, and decision-making. In organizational contexts, artificial intelligence has been increasingly adopted to support data-driven decision-making, automation, and operational efficiency. Recent literature identifies several key AI-related variables that are particularly relevant to organizational performance and sustainability. These include AI-enabled data analytics, which support real-time analysis and forecasting; process automation, which reduces administrative burden and operational inefficiencies; AI-supported decision-making, which enhances managerial judgment; and intelligent information management, which improves service delivery and organizational coordination (Pan & Nishant, 2023; Sipola et al., 2023).

Studies focusing on AI adoption emphasize that implementation is not limited to technological infrastructure alone but also depends on organizational readiness, data quality, and employee skills. Ogrean (2023) noted that successful AI adoption requires alignment between technological capability and organizational strategy. Similarly, Jorzik et al. (2024) argued that AI-driven innovation enables organizations to redesign operational processes and create long-term value, particularly in sustainability-oriented contexts. In educational organizations, AI adoption tends to be gradual and application-oriented, focusing on administrative management, academic support services, resource planning, and institutional analytics rather than highly complex systems. These AI-related variables provide a useful foundation for examining how artificial intelligence contributes to sustainability in educational organizations.

2.3 Sustainability

Sustainability has become a central concept in both academic research and organizational practice, reflecting the need to balance economic viability, social responsibility, and environmental protection. In the context of educational organizations, sustainability is commonly understood as a multidimensional construct encompassing financial stability, environmental stewardship, and social contribution through education, research, and community engagement. Recent studies emphasize that sustainability should be integrated into strategic planning and daily operations rather than treated as a separate or peripheral initiative.

Goralski and Tan (2020) argued that sustainable development increasingly depends on the effective use of advanced technologies, including artificial intelligence, to support responsible resource management and long-term value creation. Similarly, Ta et al. (2024) highlighted that sustainability-oriented practices require continuous innovation and data-driven insights to address complex social and environmental challenges. From an organizational perspective, sustainability enables institutions to enhance efficiency, improve reputation, and strengthen stakeholder trust. Dhiman et al. (2024) further suggested that sustainability performance is closely linked to organizations' ability to adopt digital technologies that improve efficiency while reducing environmental impact.

2.4 Artificial Intelligence and Sustainability in Educational Organizations

Literature increasingly highlights a strong relationship between artificial intelligence adoption and sustainability outcomes. AI technologies enable organizations to optimize resource utilization, reduce waste, and improve decision-making across economic, environmental, and social dimensions. Toderas (2025) noted that AI applications contribute to sustainability by enhancing efficiency, supporting predictive analytics, and enabling more responsible resource management. Studies also demonstrate that AI plays a critical role in promoting environmental sustainability. Habila et al. (2023) found that AI applications support environmental monitoring, energy optimization, and emissions reduction. Similarly, Ta et al. (2024) emphasized that AI-driven systems facilitate sustainable practices by integrating environmental considerations into organizational processes.

In educational organizations, artificial intelligence adoption offers significant opportunities to enhance sustainability despite financial and resource constraints. Sipola et al. (2023) argued that AI enables organizations to improve sustainability performance by supporting data-driven decision-making and operational efficiency. However, existing research also indicates that empirical studies focusing specifically on artificial intelligence and sustainability in educational organizations remain limited, particularly in developing countries' contexts. Pan and Nishant (2023) and Ogrean (2023) emphasized the need for context-specific research to better understand how AI adoption translates into sustainability outcomes in different organizational settings. Building on these insights, the present study examines the role of artificial intelligence in enhancing the sustainability of educational organizations by identifying key AI-related variables and empirically testing their influence on sustainability performance.

3. Methodology

This study employed a quantitative research approach to examine the role of artificial intelligence in enhancing the sustainability of educational organizations in Thailand. Data was collected from 400 administrators and staff working in educational organizations across different functional areas using purposive sampling. Respondents were selected based on their

involvement in strategic, administrative, operational, or technology-related decision-making within their organizations. A structured questionnaire was developed based on an extensive review of the literature on artificial intelligence and organizational sustainability. The questionnaire included measurement items capturing artificial intelligence adoption and sustainability performance. Artificial intelligence was operationalized through indicators related to data analytics, process automation, AI-supported decision-making, intelligent information management, and organizational readiness. Sustainability was measured across economic, environmental, and social dimensions. All items were assessed using a five-point Likert scale. Descriptive statistics and exploratory factor analysis were employed to identify key artificial intelligence-related variables adopted by educational organizations. Multiple regression analysis was then conducted to examine the influence of artificial intelligence on organizational sustainability. Statistical significance was evaluated at the 0.05 level.

4. Results

This study reported the findings in accordance with the two research objectives of the study: (1) to identify key AI variables adopted by educational organizations, and (2) to examine the role of AI in enhancing the sustainability of educational organizations

4.1 Identification of Key Artificial Intelligence Variables

To address the first research objective, descriptive statistics and exploratory factor analysis were conducted to identify key artificial intelligence-related variables adopted by educational organizations. The descriptive results indicated that artificial intelligence was primarily adopted through practical and application-oriented solutions that directly supported administrative, operational, and managerial activities, rather than through highly complex or experimental AI systems. Exploratory factor analysis using principal component analysis with varimax rotation revealed four distinct artificial intelligence factors with eigenvalues greater than 1. Together, these factors explained a substantial proportion of the total variance, indicating a stable and meaningful structure of artificial intelligence adoption among educational organizations.

Table 1: Key Artificial Intelligence Variables Identified Through Exploratory Factor Analysis

AI Variable	Description	Literature Review
AI-enabled Data Analytics	Use of AI for data analysis, forecasting, and performance monitoring	Pan & Nishant (2023) Sipola et al. (2023)
Process Automation	Application of AI to automate routine tasks and improve operational efficiency	Ta et al. (2024) Dhiman et al. (2024)
AI-supported Decision Making	Use of AI tools to support planning and managerial decision-making	Ogrean (2023) Goralski & Tan (2020)

AI Variable	Description	Literature Review
Intelligent Information Management	Use of AI to manage information flows and support service delivery	Jorzik et al. (2024) Pan & Nishant (2023)

These findings suggest that educational organizations adopted artificial intelligence mainly to support data-driven decision-making, improve operational efficiency, and enhance information management. This pattern reflects a pragmatic approach to AI adoption, shaped by institutional needs and resource constraints.

4.2 Role of Artificial Intelligence in Enhancing Sustainability of Educational Organizations

To address the second research objective, multiple regression analysis was conducted to examine the influence of artificial intelligence on the sustainability of educational organizations. Overall sustainability, measured across economic, environmental, and social dimensions, was specified as the dependent variable, while the identified artificial intelligence variables were included as independent variables.

The regression results indicated that artificial intelligence adoption had a statistically significant positive effect on organizational sustainability. Among the AI-related variables, AI-enabled data analytics and process automation exerted the strongest influence on sustainability performance, followed by AI-supported decision making and intelligent information management.

Table 2: Summary of Regression Results

AI Variable	β	p-value
AI-enabled Data Analytics	0.31	< 0.01
Process Automation	0.28	< 0.01
AI-supported Decision Making	0.22	< 0.05
Customer Intelligence	0.19	< 0.05

** $R^2 = 0.47$*

The regression model explained approximately 47 percent of the variance in organizational sustainability, indicating that artificial intelligence played a meaningful role in enhancing sustainability outcomes in educational organizations. The results suggest that institutions leveraging artificial intelligence for data-driven insights and operational automation tended to achieve higher levels of sustainability across economic, environmental, and social dimensions.

The findings demonstrate that artificial intelligence adoption in educational organizations was characterized by a focus on practical applications that directly supported institutional operations. The results provide empirical evidence that artificial intelligence functions as an important enabler of sustainability by improving efficiency, strengthening organizational resilience, and supporting long-term sustainable development in educational organizations.

5. Conclusion

This study examined the role of artificial intelligence in enhancing the sustainability of small and medium-sized enterprises in Thailand. The findings addressed two key research objectives. First, the results indicated that SMEs primarily adopted artificial intelligence through practical and application-oriented variables, including AI-enabled data analytics, process automation, AI-supported decision making, and customer intelligence. These variables reflected how SMEs selectively employed artificial intelligence to support daily operations and managerial activities while operating under resource constraints.

Second, the empirical results demonstrated that artificial intelligence played a significant positive role in enhancing SME sustainability. SMEs that actively adopted artificial intelligence tended to achieve higher sustainability performance across economic, environmental, and social dimensions. In particular, the use of AI for data-driven analysis and operational automation emerged as especially influential in improving efficiency, strengthening organizational resilience, and supporting long-term business viability.

The findings suggested that artificial intelligence should be viewed not merely as an advanced technology, but as a strategic enabler of sustainable development in the SME context. From a practical perspective, SME owners and managers could leverage artificial intelligence to enhance decision-making, optimize resource utilization, and respond more effectively to evolving market and stakeholder expectations. At the policy level, targeted support mechanisms, such as capacity-building programs and digital readiness initiatives, may further facilitate effective artificial intelligence adoption among SMEs. This study contributes empirical evidence to the growing literature on artificial intelligence and sustainability and highlights the potential of artificial intelligence as a key driver of sustainable SME development.

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