Artificial Intelligence Adoption and Sustainable Business Performance: The Mediating Role of Operational Efficiency

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Abstract

Organizations face huge pressure to adopt intelligence while improving sustainability and ESG performance. This study analyzes how artificial intelligence adoption relates to business performance, and it tests whether operational efficiency acts as the link between the two. By analyzing dynamic capability theory, the study is based on an explanatory research approach. The collection of data through a survey of managers and executives from five industries: manufacturing, information technology, banking and financial services, retail, and agriculture. The questionnaire is designed to assess intelligence adoption, operational efficiency, and sustainable/ESG performance using validated five-point Likert scales. The expected finding is that artificial intelligence adoption will show a link to sustainable business performance. Operational efficiency is expected to explain this link, suggesting that artificial intelligence improves sustainability mainly by improving operational processes rather than through a direct effect. The results give managers a clear path: focus on artificial intelligence projects that clearly boost operational efficiency. This approach is likely to produce greater sustainability gains than adopting artificial intelligence without improving operational processes. Previous researchers has explored change as a bridge between artificial intelligence and sustainability. This study aims to identify operational efficiency as the exact mediator, giving a more detailed and useful explanation of how artificial intelligence creates sustainable business value.

Keywords: Artificial intelligence adoption; Operational efficiency; Sustainable performance; ESG; Mediation analysis; business performance; Dynamic capability theory

Introduction

Each and every organization will have two major goals one is to make profits while maintaining sustainability. Sustainability is now seen not as an environmental issue but also as an economic, social and ESG goals. Intelligence or AI is a powerful technology that can help with this change. AI tools such as analytics, automation, smart decision support and real-time monitoring can help firms spot waste forecast better and use resources more wisely. Yet buying AI does not always lead to sustainability performance. Companies may spend a lot on AI. Still not see gains in efficiency or sustainability. The key issue is not just if AI is used. How AI use becomes clear measurable sustainability benefits Existing literature has examined several individual relationships. AI has been associated with forecasting, demand planning and resource optimization, while other studies have examined AI in relation to digital transformation, organizational change and ESG performance. Nevertheless, these relationships frequently remain fragmented. Research has looked at separate links. AI has been tied to forecasting, planning for demand and using resources better. Other work has studied AI in relation to change how organizations shift and ESG performance. Still these connections are often broken apart. This study builds a framework that fills the gap by putting AI use, operational efficiency and sustainable business performance in an order. It shows that operational efficiency is the bridge that turns AI use into sustainability results.

Research Problem: -The problem is that companies cannot turn the power of AI into clear company-wide sustainable results.

The Solution: This research framework tries to solve the problem by looking at efficiency as a possible link between AI use and sustainable business performance.

Research Question: What is the link between AI use, operational efficiency and sustainable business performance and how much does operational efficiency explain the link between AI use and sustainable business performance?

Literature Review and Research gap

1. **Artificial Intelligence Adoption and Organizational Capability**
   AI has moved from rule-based tasks to advanced predictive and decision help. Brynjolfsson and McAfee (2014) discovered that laid the foundation for AI in organizational effectiveness. In firms AI can aid forecasting, automation spotting patterns and data-based choices. Toorajipour et al. (2021) Show that AI is growing in supply-chain forecasting, planning and resource use. These changes mean AI is not a tech buy. Its real worth depends on how a firm mixes AI into its processes managers' decisions and strategy.

2. **AI and Sustainability**
   Researchers are paying attention to how AI ties to sustainability. AI helps firms spot patterns in data guess needed resources and make better operational choices. Ahdadou, Aajly and Tahrouch (2025) highlight that both firm skills and tech skills are key to using AI for sustainability and change. Ghosh et al. (2025) Look at how knowing AI can shape sustainability via new business models and how firms make sense of it. These works show that AI can help sustainability through processes not just by installing tech."

3. **AI, Organizational Change and Sustainable Performance**
   Studies also look at how organizational change's a route for AI to affect sustainability. Li and Jin (2024) studied how strong AI use impacts sustainability and found that change in the firm is a key middle step. Espina-Romero et al. (2026) Also show links between shift, firm intelligence and sustainability but say the links are still split apart. These papers give a base for this study. Change is a wide idea. We still need to find a specific operational route where AI use creates sustainable business gains.

Table1:-Comparison between present study with future studies

Study	**AI Adoption / AI Capability**	**Operational Efficiency / Resource Optimization**	**Sustainable Business Performance / ESG**	**Key Focus**
Brynjolfsson & McAfee (2014) [1]	Yes	Yes	No	AI, automation and productivity
Toorajipour et al. (2021) [2]	Yes	Yes	No	AI applications for forecasting, planning and resource optimization
Li & Jin (2024) [3]	Yes	No	Yes	AI adoption intensity and corporate sustainability through organizational change

Ghosh et al. (2025) [5]	Yes	No	Yes	AI, business-model innovation and corporate sustainability
This Work	**Yes**	**Yes**	**Yes**	**AI adoption → Operational Efficiency → Sustainable Business Performance**

Operational Efficiency as the Mechanism

Operational efficiency means a firm can use its resources, work flows and skills well while cutting needless costs, waste and slowdowns.AI can boost efficiency in ways such as better forecasting, Smart resource use, automating tasks, predicting maintenance, predicting demand, optimizing stock, IOT and Making manager choices based on data. When efficiency rises it helps sustainability by cutting waste raising output cutting use and backing more careful firm work. Sariyer et al. (2024) Suggested using prescriptive analytics to assess ESG performance showing that analytics systems can help firms make sustainability choices. Xie, Luo and Tan (2025) also found that using AI tech links to ESG performance. These studies back both parts of the path: AI use leads to better operations and better operations lead to sustainability gains. This study brings those links together into one path.

Foundation: Dynamic Capability Theory

Dynamic capabilities show how firms build, mix and change resources and skills to handle shifting surroundings. Using AI can be seen as a skill that lets companies process data, spot patterns predict changes and help managers decide.

1. **Sense:** Identify opportunities, dangers, market shifts and sustainability needs.
2. **Seize:** Use AI data and analytics to make operational and strategic choices.
3. **Transform/Reconfigure:** Change work processes and resource set-ups to raise efficiency and sustainability.

The proposed framework consists of three principal constructs:

1. **Independent Variable-**AI Adoption
2. **Mediating Variable-**Operational Efficiency
3. **Dependent Variable-**Sustainable Business Performance

The proposed relationship is AI Adoption → Operational Efficiency → Sustainable Business Performance. This framework goes beyond a tech-to-performance link by looking at how better operations turn tech power into sustainable value.

Proposed Hypotheses

Based on the theoretical arguments and literature synthesis, the following hypotheses are proposed for subsequent empirical validation.

H1-AI adoption is positively associated with operational efficiency.

H2-Operational efficiency is positively associated with sustainable business performance.

H3-AI adoption is positively associated with sustainable business performance.

H4-Operational efficiency mediates the relationship between AI adoption and sustainable business performance.

The proposed hypotheses build upon the broader research framework, which identifies relationships between AI adoption, resource optimization, ESG performance, operational efficiency and sustainability-oriented transformation. The proposed framework will subsequently be subjected to empirical validation using a structured questionnaire administered to managers and executives across selected sectors. The intended sectors are Manufacturing, Information Technology, Banking and Financial Services, Retail, Agriculture and allied sectors. The questionnaire is proposed to use validated measures and five-point Likert scales to assess AI adoption, operational efficiency and sustainable business performance. The empirical stage will subsequently examine the proposed relationships and determine whether operational efficiency significantly mediates the relationship between AI adoption and sustainable business performance.

Expected Contribution

Table 2:-Expected contributions

Theoretical Contribution	**Managerial Contribution**	**Research Contribution**
The study contributes to AI and sustainability literature by applying Dynamic Capability Theory to explain how AI adoption can become an organizational capability rather than merely a technological investment. More specifically, the framework introduces operational efficiency as a focused mechanism connecting AI adoption with sustainable business performance	For managers, the framework suggests that simply investing in AI may not be sufficient to generate sustainability benefits. Organizations should prioritize AI initiatives that improve resource utilization; process efficiency; forecasting; automation; decision quality; and sustainability monitoring. This provides a practical pathway for managers seeking to convert AI investment into sustainable business value.	The proposed framework provides a foundation for empirical testing across multiple industries. The subsequent research can determine whether the proposed relationships remain consistent across manufacturing, IT, banking, retail and agriculture. This is consistent with the broader research objective of moving from framework development toward empirical validation and sector-specific testing.

Discussion

The proposed framework responds to an important limitation in existing AI-sustainability research. Existing studies have demonstrated relationships between AI and sustainability, AI and organizational change, and AI and ESG performance. However, the precise operational pathway through which AI creates sustainable business value requires further investigation. Operational efficiency provides a theoretically meaningful mechanism because AI is capable of transforming how organizational resources, information

and processes are managed. The distinction is important because organizations may adopt sophisticated AI systems without achieving meaningful sustainability improvements if the technology is not integrated into organizational processes. The framework therefore emphasizes organizational capability and process transformation rather than technology adoption alone.

Conclusion

Artificial intelligence has potential to change how companies work and help them perform sustainably. Nevertheless, the value of AI depends on how companies put AI into their day-to-day operations. This study looks at efficiency as a bridge between AI adoption and sustainable business performance. Based on Dynamic Capability Theory the idea is that AI lets companies spot chances make choices and adjust their processes, which boosts operational efficiency and can strengthen sustainable business performance. The current paper focuses on theory a review of the literature, the research gap, the proposed framework and the hypotheses. The next step will be a survey that tests these ideas. Future research will test the proposed links in manufacturing, information technology, banking and financial services, retail and agriculture. The evidence that comes out will sharpen the framework. Show which paths, in each sector let AI help a business transform sustainably.

References

1. Ahdadou, M., Aajly, A., & Tahrouch, M. (2025). Artificial intelligence (AI) for good? Enabling organizational change towards sustainability. *Review of Managerial Science*.
2. Bawa, A., & Asongu, S. A. (2026). Investigating how firms in emerging economies integrate AI-driven systems and ESG metrics into biodiversity conservation and circular economy strategies. *Business Strategy and the Environment*.
3. Brynjolfsson, E., & McAfee, A. (2014). *The Second Machine Age: Work, Progress, and Prosperity in a Time of Brilliant Technologies*. W. W. Norton & Company.
4. Espina-Romero, L., Parra, D. R., Noroño Sánchez, J. G., Izaguirre Olmedo, J., Fernandez Díaz, E., & Julon Nieto, Y. (2026). Bridging the microfoundations of organizational intelligence for sustainability. *Sustainability, 18*(12), 6020.
5. Ghosh, V., Chotia, V., Alghafes, R., Basahel, S., & Nazrul, A. (2025). Bridging AI minds and corporate sustainability: The role of business model innovation and organizational sensemaking. *Technological Forecasting and Social Change, 218*.
6. Li, J., & Jin, X. (2024). The impact of artificial intelligence adoption intensity on corporate sustainability performance: The moderated mediation effect of organizational change. *Sustainability, 16*(21), 9350.
7. Qalati, S. A., & Siddiqui, F. (2026). Organizational sustainable artificial intelligence capabilities: Scale development, validation, and implications. *Journal of Innovation & Knowledge, 11*.
8. Sariyer, G., Mangla, S. K., Chowdhury, S., Sozen, M. E., & Kazancoglu, Y. (2024). Predictive and prescriptive analytics for ESG performance evaluation: A case of Fortune 500 companies.
9. Toorajipour, R., Sohrabpour, V., Nazarpour, A., Oghazi, P., & Fischl, M. (2021). Artificial intelligence in supply chain management: A systematic literature review. *Journal of Business Research, 122*, 502–517.
10. Xie, H., Luo, J., & Tan, X. (2025). Artificial intelligence technology application and corporate ESG performance—evidence from national pilot zones for AI innovation and application. *Frontiers in Artificial Intelligence*.