Chapter 4
Digital Sustainability Models Integrating AI for Enhanced Business and Environmental Performance

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ABSTRACT

In digital sustainability, it explores AI's transformative role with economic growth coming hand in hand with stewardship of the environment. Industry-specific case studies have been covered within energy, manufacturing, and logistics, covering issues of resource optimization, emission reductions, and circular economy practices-all factored into here. Covered are challenges along data privacy lines, AI bias, and ethics trade-offs plus scalable frameworks, public-private partnerships, and policy recommendations. Potential AI support for SDGs helps envision the potential of such systems in helping sustain resilient, sustainable businesses. Introducing AI helps organizations innovate toward environmental responsibility and work toward a sustainable future by global collective efforts.

DOI: 10.4018/979-8-3373-0608-7.ch004

1. INTRODUCTION

The complexity of bringing business operations profitability in line with the environmental and social concerns has grown much more challenging today. It is accompanied by a huge demand for climate change, resource depletion, and environmental degradation. For this reason, sustainability has emerged as a part of the modern business strategy. Artificial Intelligence has evolved as a transformative enabler in the domain of sustainability, making the organizations sustainably equipped. It further empowers AI in business operations through predictive analytics and automation to optimize processes, improve resource efficiency, and enhance innovation that fuels economic growth and addresses critical environmental issues toward a future where sustainability and business prosperity are aligned (DAPL 2025).

AI-driven digital sustainability models transform traditional business models. The use of AI will bring in a drastically reduced resource requirement, decrease the emission, and embrace the circular economy with practices like waste reduction and recycling. Indeed, AI has become transformative for most industries-from managing energy grids to optimize renewable energy production efficiency, optimising the process of manufacturing and thereby reducing resources wastage to minimum, and improving logistics that minimizes the carbon footprint at every step in supply chains. These apps demonstrate how AI can bring quantifiable improvements to sustainability while encouraging business innovation against key environmental problems. This brings out the two-edged benefits AI offers in both efficiency of operation and preservation of the environment in the new organisations.

On the other hand, implementing AI within the realm of sustainability faces problems, especially about data privacy and the possible presence of biases from algorithms. This means there would be ethical trade-offs in economic interests versus environmental protection. For example, the algorithms used by the AI might unconsciously perpetuate biases or issues related to handling sensitive information appropriately (Alvarez & Marsal, 2024; Domínguez Hernández & Galanos, 2023). In this respect, the organizations need responsible AI practices to ensure transparency, fairness, and inclusivity of the applications for overcoming these challenges (Neudesic, 2024; Stanford University, 2024). This balanced approach enables businesses to realize the full transformative potential of AI while mitigating associated risks, thereby framing innovation with ethical accountability (Mittal et al., 2023; Pagliari et al., 2024).

For AI-enabled sustainability models to be scaled up, partnership will have to be drawn from the corporate, governmental, and civil society spheres. Scalable frameworks will be catalytic action toward progress in terms of public-private partnerships and supportive regulatory policies (Accenture, 2024; ITU, n.d.). All efforts align with the United Nations Sustainable Development Goals while it acts as an accelerator for systemic change through AI (United Nations, n.d.; UNDP, n.d.). So, it shifts organizations into becoming more environment-conscious by aligning sustainability at the core business strategy. So, it can be seen that innovation comes alongside responsibility, allowing an enterprise to be the leader in changing its future toward sustainability and resilience (Devex, n.d.; Reuters, 2024).

2. AI-DRIVEN DIGITAL SUSTAINABILITY: KEY CONCEPT AND APPLICATIONS

The integration of AI into the digital sustainability frameworks offers the ultimate approach in overcoming the paradox between environmental stewardship and economic development. Harnessing High-Performance Computing and AI for Environmental Sustainability is crucial in Business Management as it equips leaders with advanced tools to optimize resource use, reduce waste, and drive sustainable