Chapter 2
Enhancing Sustainable Supply Chain Through AI Embedded in ERP Systems

Ali Elsayed Mohamed Fathalla
https://orcid.org/0009-0005-6329-8718
Faculty of Commerce, Al-Azhar University, Egypt

Ahmed Mohamed Saber Ibrahim
https://orcid.org/0009-0006-4608-7588
Osim Higher Institute for Administrative Sciences, Egypt

ABSTRACT

Incorporation of Artificial Intelligence (AI) into supply chain operations creates a paradigm shift, changing processes to realize more performance and responsiveness. In this chapter, the authors explore how artificial intelligence (AI) integrated into enterprise resource planning (ERP) systems can enhance the sustainable performance of supply chains. Sitting at the intersection of digitalization and sustainability, it examines how AI-enabled ERP utilizes better decision-making, reduces inefficiencies, and boosts resilience in global supply chains. Both the environmental, economic, and social aspects of sustainability are discussed and highlight the additional smart connection of Internet of Things (IoT) sensor information, blockchain, and the analysis of big data even more. A number of case studies in the manufacture, retailing, and logistics sectors demonstrate how AI-ERP solutions are generating real sustainability value. Finally, the chapter unveils the future research and practice directions with a special focus being placed at the convergence of AI and ERP.

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INTRODUCTION

In recent decades, global value chains have become complex. They are now data-driven webs. These webs show interdependency and risk. Competition remains ongoing and intense. Globalization and innovation opened new markets. They also brought significant sustainability challenges. Organizations must respond in ways that go beyond just compliance or cutting costs. Sustainability is now central to supply chain excellence. Cost pressures, demand changes, and logistical issues still challenge resilience. Social factors such as labor values and stakeholder impacts complicate management. Sustainability now includes environmental, economic, and social needs (Min, 2010).

Literature review shows that traditional supply chain management methods rely on past data. They use manual tracking and rigid planning. These methods become less suitable for handling complexity (Zamani et al., 2022).Supply networks generate massive real-time data. Intelligent solutions are needed. They must process and respond to this information. Data analysis shows that organizations stuck in traditional, human-driven decision-making struggle to achieve agility and transparency in changing environments. This challenge has led to a rapid shift toward digital transformation. Organizations aim to harness the predictive and adaptive features of modern technologies.

Digital transformation is not just about automating processes and other things; it's about making data-driven decisions, where transparency is essential. Therefore, technologies like artificial intelligence, the Internet of Things, blockchain, and analytics play a crucial role in promoting sustainability(Aktas, 2024; Culot et al., 2024). Their intersection brings together important environmental metrics. This includes carbon footprint, waste volumes, and energy consumption. These metrics are integrated into operating dashboards and performance systems. Digital transformation changes the game. Companies now compete by measuring and reducing carbon footprints. They aim to stay profitable while doing so.

The Enterprise Resource Planning (ERP) system is key to digital transformation. It acts as a central nervous system for businesses. It helps coordinate activities like procurement, manufacturing, logistics, and finance. Traditional legacy ERP systems have offered data integration and process standardization. However, they have been reactive and descriptive.

AI integration changes ERP systems. It moves them from reactive reporting to proactive intelligence. This is done using predictive and optimization algorithms. AI-ERP integration boosts a company's ability to predict demand. It helps anticipate disruptions. Resources can be allocated better for sustainability. Predictive analytics can measure carbon emissions on transportation corridors. According to Li (2025) and Iseri et al. (2025), optimization modules can balance cost savings with envi-