

Port 4.0: Integrating Advanced Technologies to Transform Port Operations

Abdelghani Benayoune

Head of Research and Graduate Studies - IMCO
Professor in the Department of Logistics Management
National University of Science and Technology, IMCO
Muscat, Oman

a.benayoune@imco.edu.om

Abstract

“Port 4.0” is the concept of integrating advanced technologies such as the Internet of Things (IoT), big data, Artificial Intelligence (AI) and Blockchain to enhance the overall efficiency of the port operations. “Port 4.0” has the potential to transform port operations, making them more secure, and environmentally sustainable. As “Port 4.0” is still at a nascent stage in the maritime industry, the paper aims to provide a comprehensive review and analysis of key technologies related to “Port 4.0”, their potential benefits and challenges and future trends and development. The findings indicate that the implementation of “Port 4.0” technologies can improve efficiency, reduce costs, and enhance competitiveness and while increasing supply chain transparency. However, challenges such as high implementation costs, system integration, cyber risks, and a lack of digital talent need to be addressed. Collaboration among port stakeholders was found to be critical in driving innovation and competitiveness. Policy responses and recommendations for future research were also presented.

Keywords

Port 4.0, Smart Port, Sustainability, Maritime Industry, Supply Chain