

Digital Systems Enabling Predictability in Export Logistics

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Abstract

Increasing complexity in global trade, regulatory requirements, and cost pressures make predictability and pre-planning critical in export logistics. This study presents a digital decision support system that pre-plans export shipments from departure to final delivery, taking into account operational preferences, warehouse options, port selection, and regulatory requirements of the destination country. The system employs a simulation-based analysis to model multiple scenarios, evaluating the impact of different operational decisions on shipment cost, time, and risk. By simulating various shipment routes and strategies, stakeholders can visualize the process in advance, optimize resource allocation, and improve overall operational efficiency. The simulation also incorporates real-world constraints, such as customs inspection requirements, variable handling times, and potential delays, to provide a realistic and practical planning tool. Moreover, the system generates predictive metrics for each scenario, including estimated total cost, transit time, and risk exposure, allowing decision-makers to compare alternatives quantitatively. It also supports strategic planning for contingency measures and resource allocation, enabling companies to anticipate bottlenecks and reduce operational uncertainty. Initial implementation results suggest that integrating such digital tools into export logistics processes not only improves predictability but also enhances communication among stakeholders and facilitates compliance with international trade regulations. Furthermore, the system contributes to sustainability goals by identifying more efficient routes and reducing unnecessary transport movements. In conclusion, algorithm-based digital decision support systems represent a valuable innovation for export logistics, combining operational efficiency, risk mitigation, and strategic foresight. This study demonstrates that simulation-driven planning can transform traditional export management into a proactive and data-informed process.

Keywords

Digital Systems, Export, Logistic, Simulation-Based Analysis.

Biography

Burcu Alatepeli is an Assistant Professor in the Department of International Trade at Alparslan Türkeş Science and Technology University, Turkey. She holds a Ph.D. in Production Management from Çukurova University, where she was awarded the YÖK 100/2000 Doctoral Scholarship in the thematic field of Supply Chain Management. She earned her Master's degree in Engineering and Technology Management from the Department of Industrial Engineering at Çukurova University and her Bachelor's degree in Business Administration. Dr. Alatepeli has professional experience in international trade, customs operations, and supply chain management, having previously worked in global manufacturing firms. She has published journal articles and conference papers on digitalization in international trade, customs single window systems, supply chain management, logistics, blockchain technologies, and decision-support systems. Her current research interests focus on artificial intelligence in customs operations, digital trade facilitation, e-logistics, and human-AI interaction in supply chain and regulatory processes.