ABSTRACTS

https://doi.org/10.22306/al.v12i4.667 *Received: 17 Dec. 2024; Revised: 09 Mar. 2025; Accepted: 16 July 2025*

Optimization of fruit and vegetable logistics in the Port of Valparaíso, Chile, through strategic logistics platforms and blockchain technology

Manuel Romero-Julio
Department of Industrial Engineering, University of Santiago de Chile, Ecuador Avenue 3769 Central Station, Santiago, Chile, manuel.romero.j@usach.cl (corresponding author)
Diana Sánchez-Partida
Department of Logistics and Supply Chain Management, UPAEP University, 17 Sur 901, Santiago neighborhood, CP 72410 Puebla, Puebla, Mexico, diana.sanchez@upaep.mx
Ivan Derpich-Contreras
Department of Industrial Engineering, University of Santiago de Chile, Ecuador Avenue 3769 Central Station, Santiago, Chile, ivan.derpich@usach.cl

Keywords: port logistics, logistics platforms, blockchain technology, localization model, sustainability.
Abstract: This study addresses optimizing the fruit and vegetable logistics chain at the Port of Valparaíso, Chile, a key hub for exports in the Southern Hemisphere. Through an integrated approach, it combines logistics platforms (in Limache and Quillota), blockchain technology, and a Capacitated Facility Location Problem (CFLP) mathematical model. These tools help mitigate traffic congestion, high logistics costs, and limited traceability, achieving up to a 25% savings in operating expenses, a 30% reduction in CO_2 emissions, and a 50% decrease in waiting times. Integrating blockchain ensures immutable records, improving supply chain trust and the quality of exported products. This proposal, aligned with Industry 5.0 principles, promotes economic resilience and sustainability, positioning the Port of Valparaíso as an international benchmark for logistics innovation. The framework can be replicated in other ports, contributing to more efficient and sustainable supply chains and reducing urban congestion. Finally, the paper discusses social and political risks associated with infrastructure development, compares MILP with other optimization methods (heuristics or metaheuristics), and expands on the model's potential application to different ports, including dry ports or those with limited capacity.

https://doi.org/10.22306/al.v12i4.696 *Received: 17 Mar. 2025; Revised: 24 Apr. 2025; Accepted: 21 May 2025*

Multimodal transport efficiency in agricultural supply chains: a case study of rail-road integration in Thailand's sugar logistics

Krissada Namchimplee
Saga University, 1 Honjo-machi Saga-city, Saga 840-8502, Japan,
krissada.na@ksu.ac.th (corresponding author)
Takuro Inohae
Saga University, 1 Honjo-machi Saga-city, Saga 840-8502, Japan,
d3236@cc.saga-u.ac.jp
Arjaree Saengsathien
Kalasin University, 62/1 Kasetsomboon Road, T. Kalasin, A. Mueang, Kalasin 46000, Thailand,
arjaree.sa@ksu.ac.th

Keywords: multimodal transport, transport cost, carbon emissions, sugar logistics, geographic information system.
Abstract: Freight transportation is a key driver of agricultural supply chains that impacts both economic efficiency and environmental sustainability. In Thailand, sugar logistics relies heavily on road transport, leading to high operational costs, congestion, and significant carbon emissions. As the demand for cost-effective and sustainable logistics solutions

grows, multimodal transport that integrate rail and road—has emerged as a promising alternative. This study evaluates the feasibility and competitiveness of rail-road combined transport for sugar logistics in Northeast Thailand, focusing on its potential to reduce costs and emissions. A geographic information system-based route optimization framework is applied to compare the transport expenses and CO_2 emissions of road-only and multimodal models. Using data from 21 sugar mills, a multimodal cost model is developed, incorporating factors such as fuel consumption, fuel price, handling fees, transport distance, number of containers, and emissions impact. The findings reveal that shifting sugar logistics to a rail-road system can reduce costs by up to 67.81% and lower CO_2 emissions by 76.50% for distances exceeding 200 km, aligning with Thailand's green logistics goals. However, infrastructure gaps and high investment costs remain barriers. To facilitate multimodal transport adoption, strategic investments, policy support, and industry collaboration are essential. This study contributes to the sustainable development of agricultural freight transport by providing data-driven insights for policymakers and industry stakeholders.

https://doi.org/10.22306/al.v12i4.697 *Received: 18 Mar. 2025; Revised: 30 Apr. 2025; Accepted: 28 June 2025*

Optimization opportunities in matrix production

(pages 627-641)

Ibolya Hardai
University of Miskolc, HU-3515 Miskolc-Egyetemváros Hungary, Hungary, EU,
hardaiibolya@gmail.com (corresponding author)
Bela Illes
University of Miskolc, HU-3515 Miskolc-Egyetemváros Hungary, Hungary, EU,
bela.illes@uni-miskolc.hu
Zoltan Besse
ZL Rendszerház Ltd, HU-1137, Budapest, Radnóti M. St. 38., Hungary, EU
zl@zl.hu
Agota Banyai
University of Miskolc, HU-3515 Miskolc-Egyetemváros Hungary, Hungary, EU,
agota.banyaine@uni-miskolc.hu

Keywords: logistics, Industry 4.0, matrix production, route planning, layout optimization.
Abstract: Nowadays, due to rapidly changing customer needs, product life cycles are getting shorter, while the number of product variants is increasing, so continuous innovation of the product and the technology related to its production is an important task. Not only the product itself needs to be renewed, but also flexible production technology needs to be developed in accordance with changing customer needs, as a large number of product variants are being produced, which require individual settings, different production operations and real-time tracking. In the case of diversified manufacturing requirements, the application of Industry 4.0 technologies can increase efficiency. The aim is to maintain the smoothness of the manufacturing process, for which matrix production offers a suitably flexible solution. The main tasks of production logistics are the in-plant movement of workpieces between workstations and the supply of workstations with the raw materials, parts, etc. required for the actual production step. The larger workpieces are transported by dedicated AGVs. In the production area, several AGVs can perform their tasks simultaneously, so several material handling tasks occur at the same time. This paper deals with the route planning issues emerging during the movement of AGVs between the workstations in a multi AGV environment. We are following a holistic approach during design, aiming to simultaneously optimize layout, production sequence, and AGV routing.

ABSTRACTS

https://doi.org/10.22306/al.v12i4.699 *Received: 29 Mar. 2025; Revised: 21 Oct. 2025; Accepted: 06 Nov. 2025*

NetLogo for transport and logistics: agent-based modeling of flows, control, and operations

(pages 643-655)

Duy-Thoi Do
Faculty of Civil Engineering, Ho Chi Minh City University of Technology and Education, Vo Van Ngan Street, Thu Duc Ward, Ho Chi Minh City, Vietnam, dthoidd.ncs@hcmute.edu.vn
Vu-Tu Tran
Faculty of Civil Engineering, Ho Chi Minh City University of Technology and Education, Vo Van Ngan Street, Thu Duc Ward, Ho Chi Minh City, Vietnam, tutv@hcmute.edu.vn (corresponding author)

Keywords: NetLogo simulation, agent-based modelling (ABM), transport and logistics systems, traffic-flow optimisation, multi-scale and behavioural modelling.
Abstract: NetLogo is widely used for agent-based simulation of transport and logistics because it is open, flexible, and fast to prototype. This review synthesizes peer-reviewed studies on NetLogo across four application streams: (a) Intelligent Transport Systems (ITS) and flow optimisation; (b) Public-transport operations and evacuation management; (c) Traffic-control, energy use, emissions analysis; and (d) Driver/vehicle behaviors and connected/autonomous vehicle modelling. We map how agent rules, interaction topologies, and calibration choices shape material, information, and human flows across networks and terminals, and how they inform transport operations, distribution logistics, and supply chain decisions. A thematic synthesis highlights five recurring gaps: (1) Oversimplified agent size/geometry; (2) Limited behavioral realism for drivers, passengers, and controllers; (3) Weak mesoscopic linking between macro demand and micro operations; (4) Short time horizons for dynamics of congestion and energy; and (5) Incomplete calibration-verification-validation. We propose a logistics-oriented research agenda: multi-scale coupling (macro–meso–micro), behavior learning with ML, real-time digital-twin use cases, standardized CV&V protocols, and energy-emissions co-metrics. The review clarifies where NetLogo adds value to transport logistics - rapid what-if testing of control policies, routing, and terminal operations - while outlining steps needed for rigorous, decision-grade models.

https://doi.org/10.22306/al.v12i4.700 *Received: 07 Apr. 2025; Revised: 21 June 2025; Accepted: 30 July 2025*

Buffer positioning optimization in Demand-Driven DRP: model development and case study

(pages 657-665)

Yassine Erraoui
University Mohammed V, Industrial Engineering Department, Mohammadia School of Engineers, Zip Code 765, 10090, Rabat, Morocco, y.erraoui@emi.ac.ma (corresponding author)
Abdelkabir Charkaoui
University Hassan 1st, The Laboratory of Engineering, Industrial Management and Innovation, Faculty of Science and Techniques, Zip Code 577, 26000, Settat, Morocco, abdelkabir.charkaoui@uhp.ac.ma
Zineb Aman
Moulay Ismail University, Industrial Engineering Department, ENSAM School, Zip Code 50500, 15290, Meknès, Morocco, zineb.aman@gmail.com

Keywords: supply chain, distribution networks, Bullwhip effect, Demand-Driven DRP, buffer.
Abstract: The physical flow in distribution networks is highly susceptible to fluctuations caused by demand uncertainty. These fluctuations contribute to variability amplification across supply chain stages, known as the Bullwhip Effect. This paper investigates the conceptualization, modeling, and optimization of Demand-Driven Distribution Resource Planning (DDDRP) as a strategic management tool to mitigate this issue. We begin with a systematic literature review, covering (1) the causes, consequences, and solutions for the Bullwhip Effect and (2) conventional flow management methods, including lean distribution and the theory of constraints. Next, we present the theoretical foundation of the DDDRP model, outlining its core principles and stages. We then propose an optimization strategy of the first stage (i.e., Buffer positioning)

through mathematical modeling to enhance system performance. This model can be applied by practitioners to improve decision-making. We validate its effectiveness through a real-world case study, demonstrating significant improvements in flow stability and supply chain performance. As an emerging flow management approach, DDDRP offers a robust alternative to traditional forecast-driven methods by aligning supply with actual market demand. Its growing adoption reflects its potential to enhance agility, reduce variability, and build more resilient distribution networks.

https://doi.org/10.22306/al.v12i4.701 Received: 10 Apr. 2025; Final revised: 12 Sep. 2025; Accepted: 05 Oct. 2025

Integrating distribution and supply logistics: a systemic conceptual framework

(pages 667-680)

Martin Straka
Technical University of Košice, Faculty BERG, Institute of Logistics and Transport, Park Komenského 14, 04200 Košice, Slovak Republic, EU, martin.straka@tuke.sk

Keywords: distribution logistics, supply logistics, conceptual framework, logistics chain, logistics system.
Abstract: This paper examines the conceptual, structural, and functional relationships between distribution logistics and supply logistics, two domains that are often perceived as synonymous despite their fundamentally different roles within the logistics chain. The study clarifies frequently used terms, defines their correct positioning within distribution and supply logistics, and analyses their interconnections in the context of material, information, and financial flows. Based on established scientific literature, professional standards, and practical project experience, the paper highlights the distinctions between distribution, physical distribution, physical supply, and distribution logistics as a system. It further explains the functions of distribution in value creation, harmonisation of supply and demand, and execution of essential operational activities, including transport, storage, regrouping, and customer service. The research emphasises the systemic integration of distribution and supply as inseparable parts of a single chain, driven by the potential difference between supply and demand. The paper also outlines the structural role of distribution channels, logistics channels, and acquisition and logistics distribution subsystems, illustrating how coordinated strategic and operational decisions influence the performance of the entire logistics system. By defining key terms and illustrating their relationships, the study contributes to a clearer conceptual framework for logistics professionals and supports more accurate use of logistics terminology in academic and practical environments. The proposed framework supports consistent terminology usage in logistics education, research, and practical system design.

https://doi.org/10.22306/al.v12i4.702 Received: 13 Apr. 2025; Revised: 22 June 2025; Accepted: 05 Sep. 2025

Exploring the effectiveness of West African ports as a hub in the transatlantic logistics: a multi-criteria approach

(pages 681-696)

Paulo Correia
Shanghai Maritime University, Institute of Logistics Science and Engineering, 1550 Haigang Avenue, Pudong New Area, Shanghai 201306, China, correiapaulo90@gmail.com (corresponding author)
Chengji Liang
Shanghai Maritime University, Institute of Logistics Science and Engineering, 1550 Haigang Avenue, Pudong New Area, Shanghai 201306, China, liangcj@shmtu.edu.cn

Keywords: Pareto optimal, asymmetric hub system, nonlinear optimization, West Africa, shipping emissions and multi-gateway port model.
Abstract: Logistics costs account for up to 75% of the price of African goods, making them a greater trade barrier in Africa than tariffs and trade restrictions. Improving delivery efficiency is therefore critical for enhancing trade competitiveness. This paper examines the effectiveness of West African ports as a hub, proposing an asymmetric hub system that links West Africa, Europe, and South Americas transatlantic supply chain, and compares it with a traditional multi-gateway configuration. A multi-objective optimization approach based on the e-constraint method is adopted to generate the Pareto frontier between conflicting liner shipping goals- cost reduction, environmental sustainability, and

on-time service performance. The results highlight a strong empirical correlation between emissions reduction, fuel efficiency, and liners tactical decisions, contrasting on-time/ cost performance. This finding predicts liner's support for a higher probability of failure for on-time delivery under energy efficiency scenarios, whereas the opposite is also true, that is, improving customer service for high pollution. However, given the above goal conflicts, the analysis reveals a clear macro-level tradeoff between hubbing and de-hubbing strategies. Overall, the results suggest that adopting an asymmetric hub system can enhance West Africa trade competitiveness and sustainability. These insights should encourage policymakers to prioritize strategic hub-port investments and provide liner operators with a set of Pareto-optimal solutions for redesigning logistical networks that better balance cost, service, and environmental performance across the transatlantic supply chain.

https://doi.org/10.22306/al.v12i4.703 *Received: 14 Apr. 2025; Revised: 13 July 2025; Accepted: 31 Oct. 2025*

An overview of research on logistics outsourcing decisions

(pages 697-704)

Quynh Phuong Nguyen
Vietnam Aviation Academy, 104 Nguyen Van Troi Street, Phu Nhuan Ward, Ho Chi Minh City, Vietnam, Phuongnq@vaa.edu.vn
Minh Huong Tang
HUTECH University, 475A Dien Bien Phu, Thanh My Tay Ward, Ho Chi Minh City, Vietnam, tmhuong@hutech.edu.vn (corresponding author)

Keywords: overview, research, logistics, outsourcing, decision making.
Abstract: As the market becomes more globalized and competitive, businesses are under increasing pressure to enhance efficiency, cut costs, and focus on what they do best. One strategy that has gained traction in both practice and research is logistics outsourcing, where companies hand over logistics functions to specialized third-party providers (3PLs). This approach allows businesses to tap into expert capabilities, utilize cutting-edge technology, and scale their operations more effectively. This paper offers a comprehensive review of research on logistics outsourcing decisions, delving into key concepts, theoretical frameworks, and emerging trends. To support this, the study employs VOSviewer, a powerful bibliometric analysis tool that helps visualize and map out the structure of research in this area. By analyzing co-authorships, keyword connections, and citation patterns, VOSviewer uncovers important topics, identifies leading researchers, and highlights new trends in the field. Ultimately, the goal of this paper is to provide insights that deepen our understanding of the evolving landscape of logistics outsourcing research and help shape future studies in this space.

https://doi.org/10.22306/al.v12i4.704 *Received: 14 Apr. 2025; Revised: 17 June 2025; Accepted: 18 July 2025*

A comprehensive approach to evaluating and predicting level of service for two-lane rural highways

(pages 705-714)

Ahmed Hadi
University Sains Malaysia, School of Civil Engineering Campus, 14320 Nibong Tebal, Penang, Malaysia, ahmedhadi@student.usm.my
Farid Ezanee Mohamed Ghazali
University Sains Malaysia, School of Civil Engineering Campus, 14320, Nibong Tebal, Penang, Malaysia, cefarid@usm.my (corresponding author)
Basim Jrew
Isra University, Civil Engineering Department, P.O. Box 22, Amman 11622, Jordan, basim_jrew@yahoo.com
Ali Hassoon
University Sains Malaysia, School of Civil Engineering Campus, 14320, Nibong Tebal, Penang, Malaysia, ali.s.hassoon@gmail.com
Saad Ismael Ibrahim
Al-Iraqia University, College of Media, Unit of Rehabilitation Employment and Follow-Up, Baghdad 10001, Iraq, saad.i.ibrahim@aliraqia.edu.iq

Keywords: level of service, evaluation, transportation infrastructure, highway improvement strategies, traffic congestion.
Abstract: Highways are vital to national transportation, especially in developing countries where infrastructure challenges are common. This study evaluates and predicts the Level of Service (LOS) for a rural two-lane, two-way highway in Iraq that connects Salah al-Din and Kirkuk governorates. The road suffers from high traffic volumes, including 15% heavy vehicles, frequent accidents, and poor geometric design. It is divided into seven segments covering diverse land uses such as urban, industrial, and residential zones. Using Highway Capacity Software (HCS-2024) and methodologies from the HCM 7th Edition, the current LOS was found to range between E and F, indicating critical congestion and safety issues. These conditions negatively affect economic productivity, road safety, and quality of life. To address these challenges, the study proposes lane expansion, geometric improvements, and speed adjustments. These measures are expected to raise LOS to A and B under current conditions, and to B, C, and D in future growth scenarios. The study highlights the value of applying modern analytical tools to rural highways and provides a framework for improving traffic performance and logistics efficiency in similar contexts.

https://doi.org/10.22306/al.v12i4.705 *Received: 14 Apr. 2025; Revised: 28 June 2025; Accepted: 01 Sep. 2025*

Cash Flow Bullwhip control using a multicriteria model

(pages 715-725)

Hicham Lamzaouek
Ecole Supérieure des Industries du Textile et de l'Habillement, CELOG, Route El Jadida Km 8, BP : 7731, Quartier Laymoune, Casablanca, Morocco, lamzaouek@esith.ac.ma (corresponding author)
Hicham Drissi
Hassan II University of Casablanca, National School of Business and Management of Casablanca, LIGOD, 20250, Casablanca, Morocco, h.drissi@encgcasa.ma
Abdelsamad Chouar
Ecole Supérieure des Industries du Textile et de l'Habillement, CELOG, Route El Jadida Km 8, BP : 7731, Quartier Laymoune, Casablanca, Morocco, chouar@esith.ac.ma

Keywords: supply chain management, bullwhip effect, Cash Flow Bullwhip, multi criteria approach, MACBETH method.
Abstract: Moroccan producers of households' detergents suffered from cash flow bullwhip. This distortion of financial flow originated from the bullwhip effect produced during the COVID 19 pandemic. A recent study confirms that some performance attributes are correlated with the degree of exposure to the CFB. The relative significance of these performance criteria, however, is not immediately apparent. The objective of this research is to develop a multi-criteria mathematical model which will serve as a basis to assess the performance of the companies under study and to define the determinants of Cash Flow Bullwhip control using the MACBETH method. This research is conducted on a sample of Moroccan producers of household detergents. The findings indicate that the importance of financial variables is higher than that of supply-chain elements, and internal control factors. Good supply chain asset management, financial efficiency, financial liquidity, control activities, financial debt, and supply chain credibility are the main levers to control the CFB.

https://doi.org/10.22306/al.v12i4.707 *Received: 22 Apr. 2025; Revised: 28 June 2025; Accepted: 21 July 2025*

Basic recruitment practices for warehouse managerial positions in Bulgarian manufacturing and trading organizations

(pages 727-738)

Miroslav Stefanov
University of National and World Economy, Economics of Infrastructure Faculty, Logistics and Supply Chains Department, Student District, No.19 December 8th st., 1700 Sofia, Bulgaria, EU, m.stefanov@unwe.bg

Keywords: warehouse supervisors, warehouse managers, warehouse managerial recruitment, recruitment practices.
Abstract: The growing shortage of qualified warehouse managers over the last decade has adversely affected the ability of manufacturing and trading organizations to compete in logistics. Nevertheless, recruitment practices remain

insufficiently studied across enterprises of different sizes and countries. This article aims to fill this gap by identifying the basic internal and external techniques for attracting candidates for management positions in the warehouses of small, medium and large Bulgarian manufacturing and trading organizations. The data were collected using the questionnaire survey method. To identify differences in internal and external recruitment practices across enterprises of different sizes, the Kruskal–Wallis non-parametric test was applied, and the extent of these distinctions was further evaluated using descriptive statistics, particularly average scores. The results indicate that manufacturing and trading organizations surveyed implement basic internal and external recruitment practices to attract candidates for warehouse management positions, with statistically significant differences in their application across enterprises of different sizes. The findings reveal distinctions in the extent to which internal recruitment practices are implemented by organizations surveyed regarding the use of intranet sites and e-mails, recommendations from employees, and databases provided by voluntary job applicants. The study also identified differences in the application of external recruitment techniques related to practices such as open lectures at universities, the use of social and professional profiles, the publication of adverts in online job platforms, and the organization's website. The research findings contribute to a deeper understanding of recruitment practices in logistics and have practical implications for both scholars and industry professionals.

https://doi.org/10.22306/al.v12i4.709 *Received: 27 Apr. 2025; Revised: 19 June 2025; Accepted: 18 Nov. 2025*

Green supply chain and sustainable development performance: evidence from the agricultural sector in the Mekong Delta

(pages 739-753)

Tran Trung Chuyen
Nam Can Tho University, Faculty of Business Administration-Marketing, An Binh ward, Can Tho City, Vietnam, ttchuyen@nctu.edu.vn (corresponding author)
Phan Tran Xuan Trinh
Nam Can Tho University, Faculty of Technology and Engineering, An Binh ward, Can Tho City, Vietnam, ptxtrinh@nctu.edu.vn
Tran Thanh Huy
Nam Can Tho University, Faculty of Technology and Engineering, An Binh ward, Can Tho City, Vietnam, tranthanhhuy@nctu.edu.vn

Keywords: green supply chain management, sustainable development performance, Mekong Delta agriculture, environmental performance, green marketing.
Abstract: Growing environmental awareness and regulatory pressures have made green supply chain management (GSCM) a critical strategy for sustainable development, particularly in agriculture. This study examines the impact of GSCM on sustainable development performance in the Mekong Delta's agricultural sector. It aims to explore how GSCM practices influence economic, environmental, and social performance. Employing a mixed-methods approach, qualitative data were gathered through in-depth interviews with agricultural experts, while quantitative data were collected via a survey of 211 agricultural businesses in the Mekong Delta. The topic uses SmartPLS software to analyze Partial Least Squares Structural Equation Modeling (PLS-SEM). The results indicate that GSCM practices, especially green marketing and environmental education, considerably improve all three performance areas, with green marketing having the most significant effect (path coefficients: 0.370 for EP, 0.462 for EN, 0.441 for SP). In contrast, green manufacturing shows a less pronounced and statistically insignificant economic impact ($p = 0.068$), which is retained at a 0.1 significance level due to its long-term prospects. These findings highlight the vital role of GSCM in promoting sustainable development, specifically in reducing environmental impacts while enhancing economic and social advantages. Nevertheless, the study points out the economic difficulties faced by small and medium-sized enterprises (SMEs) and urges further investigation into addressing these challenges. The results provide practical insights for businesses and policymakers in the Mekong Delta to align with Vietnam's objective of achieving net-zero emissions by 2050, highlighting the transformative potential of GSCM in encouraging sustainable agricultural practices.

https://doi.org/10.22306/al.v12i4.711 *Received: 06 May 2025; Revised: 20 June 2025; Accepted: 22 July 2025*

Logistics activities related to the non-commercial transport of companion animals

(pages 755-767)

Nicol Beregszasziova
University of Veterinary Medicine and Pharmacy in Košice, Komenského 68/73, 041 81 Košice, Slovak Republic, EU, b.nicol@zoznam.sk (corresponding author)
Janka Saderova
Technical University of Košice, Letná 1/9, 04001 Košice, Slovak Republic, EU, janka.saderova@tuke.sk
Daniela Takacova
University of Veterinary Medicine and Pharmacy in Košice, Komenského 68/73, 041 81 Košice, Slovak Republic, EU, daniela.takacova@uvlf.sk

Keywords: companion animals, legislative, logistic activities, non-commercial transport.
Abstract: The main purpose of the paper is the analysis of specific logistical requirements when transporting companion animals. Attention is focused to the obstacles that need to be addressed in the field of animal transport and the logistics associated with their commercial and non-commercial transport. The general conditions and requirements of companion animals transport within the European Union have led to unjustified administrative burdens and costs. The main goal of the contribution is to point out the circumstances on which the safe transport of animals depends, based on the selection of the correct logistics management and the selection of the correct logistics process. Special rules are applied depending on the species and quantity of transported animals. In the process of transporting companion animals, it is important to ensure that live animals entering and leaving the EU, or third countries are healthy, well-being and that the specific import and export conditions are fulfilled in European Union legislation, including all related mandatory acts, documents and data centralization. The article presents sequence of logistic activities in the transportation of companion animals for non-commercial purposes. Logistic activities are divided into two phases. The first phase (preparatory phase) includes activities that the owner of the animal is obliged to perform if he performs the transportation himself or uses a business partner for transportation. The second phase includes activities from loading to unloading the animal. The article presents selected statistics for the transportation of companion animals, too.

https://doi.org/10.22306/al.v12i4.713 *Received: 07 May 2025; Revised: 14 June 2025; Accepted: 28 Aug. 2025*

Digital transformation of supply chain management: trends and prospects

(pages 769-780)

Hassan Ali Al-Ababneh
Zarqa University, Department of Electronic Marketing and Social Media, Zarqa, Jordan, hassan_ababneh@zu.edu.jo (corresponding author)
Salem A. S. Alrhaimi
Sharjah Police Science Academy, Department of Quality and Excellence in Security Work, Sharjah, United Arab Emirates, salrhaimi@psa.ac.ae
Ibrahim Mahmoud Siam
Irbid National University, Department of Entrepreneurship, Irbid, Jordan, I.Siam@inu.edu.jo
Fadwa Issa Ahmad Alsalim
Imam Abdulrahman Bin Faisal University, Department of Computer Science, The Applied College, Dammam, Saudi Arabia, Fialsalim@iau.edu.sa
Jameel Ahmad Khader
King Saud University, Department of Applied Marketing, Riyadh, Saudi Arabia, Jkhader@ksu.edu.sa

Keywords: digital technologies, supply chains, logistics.
Abstract: Digital transformation of supply chain management is becoming a key competitiveness factor for companies around the world. The introduction of modern technologies such as the Internet of Things (IoT), artificial intelligence (AI), blockchain and robotics significantly affect information flows and the efficiency of business processes, reducing costs and improving the quality of customer service and logistics. But still, there is not yet a general approach to assessing the potential impact of these technologies on the supply chain. The main contribution of the proposed approach is that it integrates firm digital transformation in the supply chain such as Amazon, Walmart and DHL through exhaustive and flexible assessment tools. The approach provides not just the measurement of current situation but also prediction for future situation, so it can be utilized as a powerful logistics and supply chain management strategic planning tool. The findings suggest enhanced supply chain performance at Amazon, Walmart and DHL by virtue of digitalization. time in the warehouse by 30-40%, increased inventory accuracy to 99% and reduced delivery costs by 25-40%. These modifications verify that digital transformation business processes in logistics work. Digitizing supply chains results in so many benefits in terms of increased operational efficiency, lower costs and better service to customers. Their replacement by newer technologies has made the system more flexible and responsive to changes in supply and demand. The study results emphasise the importance of incorporating digital offerings to remain competitive in international markets.

https://doi.org/10.22306/al.v12i4.716 *Received: 10 May 2025; Revised: 28 June 2025; Accepted: 07 Aug. 2025*

Fermented cocoa bean logistics in an emerging country: an Agent-Based Modelling approach

(pages 781-797)

Dwi Novirani
Institut Teknologi Nasional Bandung, Departement of Industrial Engineering, Jl. PKH Mustapa 23 Bandung 40124, Jawa Barat, Indonesia, dwinov@itenas.ac.id (corresponding author)
Pradono Pradono
Institut Teknologi Bandung, Department of Transportation, School of Architecture, Planning, and Policy Development, Jl. Ganesa No.10, Lb. Siliwangi, Kecamatan Coblong, Kota Bandung, 40132, Jawa Barat, Indonesia, pradono@itb.ac.id
Gatot Yudoko
Institut Teknologi Bandung, School of Business and Management, Jl. Ganesa No.10, Lb. Siliwangi, Kecamatan Coblong, Kota Bandung 40132, Jawa Barat, Indonesia, gatot@sbm-itb.ac.id
Kiyoshi Dowaki
Tokyo University of Science, Department of Industrial and Systems Engineering, 2641 Yamazaki, Noda-shi, Chiba-ken 278-8510, Japan, dowaki@rs.tus.ac.jp

Keywords*:* interaction actor, cocoa, information sharing, supply chain, Agent-Based Modelling.
Abstract: This research aims to create a simulation model of the actors' interactions in the distribution of fermented cocoa beans in order to minimize transportation time and costs, ensure quality, and integrate information delivery within the cacao agro-industry supply chain using an Agent-Based Modelling (ABM) approach. With the enactment of the Village Unit Cooperative (VUC), it is hoped that farmers will realize the importance of cocoa bean quality in terms of fermentation, which will be provided to cocoa factories to comply with the Indonesian National Standard (SNI) 01-2323-2008. Two proposed scenarios were evaluated, and the first scenario was selected because it can reduce distribution transportation time by 94%. The results of this simulation show that by implementing efforts, such as rearranging the interactions between supply chain actors, strengthening the involvement of supporting logistics institutions, and systematically integrating the management of logistics elements will result in distribution time efficiency, transportation cost savings, and improved cocoa bean quality.