Supply Chain and Operations Decision Making

www.scodm.reapress.com

Sup. Chain Oper. Decis. Mak. Vol. 2, No. 4 (2025) 210–218.

Paper Type: Original Article

Logistics Optimization with Supplier Inventory Management Approach in a Single Factory-Multiple Distribution Branch System

Ali Najafi[1], Seyyed Hesam Eldin Zagordi[1,*]
[1] Faculty of Industrial Engineering, Tarbiat Modares University, Tehran, Iran; najafi.ali@modares.ac.ir; zegordi@modares.ac.ir.

Citation:

Received: 29 July 2025 *Revised: 01 October 2025* *Accepted: 13 December 2025*	Najafi, A., & Eldin Zagordi, S. H. (2025). Logistics optimization with a supplier inventory management approach in a single factory-multiple distribution branch system. *Supply chain and operations decision making*, 2(4), 210-218.

Abstract

In this study, a two-echelon supply chain comprising one manufacturer and several distribution centers is examined, with an emphasis on distribution and logistics optimization. The main objective of the research is to reduce logistics costs and prevent inventory shortages at distribution centers by adopting a Vendor Managed Inventory (VMI) approach. Under this approach, the manufacturer is responsible for managing inventory levels at the distribution centers and, through optimal planning, supplying the required quantities. The problem addressed in this research is the optimal distribution of products from the factory warehouse to distribution centers, ensuring that, in addition to meeting demand, logistics costs are minimized. To solve this problem, a mathematical model is developed to determine the optimal quantity of product distribution and the appropriate type of transportation fleet to minimize logistics costs and avoid inventory shortages. The case study of this research focuses on the distribution of products from the factory warehouse to multiple distribution centers.

Keywords: Logistics, Distribution, Vendor-managed inventory.

1 | Introduction

Optimizing logistics processes is a key topic in industrial engineering. Increasing market competition and the need to reduce costs have driven companies to adopt scientific approaches to optimize distribution and transportation processes [1]. One of the fundamental challenges in this field is the optimal management of product distribution from manufacturers to consumers, with the objectives of reducing logistics costs and preventing inventory shortages at distribution centers [2], [3]. In real-world conditions, the optimal product distribution problem typically involves constraints such as factory and warehouse capacity, transportation

Corresponding Author: zegordi@modares.ac.ir
https://doi.org/10.48313/scodm.v2i4.45

fleet capacity, distribution center unloading and storage capacity, and the timely fulfillment of branch demand [4], [5].

A manufacturing company producing Fast-Moving Consumer Goods (FMCG) faces the challenge of optimizing product distribution and reducing logistics costs [6]. One of the key transportation performance indicators in this factory is the transportation cost per kilogram and the cost of transporting one carton of product, which varies depending on capacity, total freight cost, distance, and the type of transportation fleet [7]. The company aims to reduce overall supply chain costs. At the same time, the demand of each distribution branch must be fully satisfied [8]. Accordingly, a mathematical model has been designed that, by considering constraints such as factory warehouse capacity, distribution center storage capacity, and vehicle type, seeks to optimize product distribution and reduce transportation costs. The manufacturing plant produces goods daily and distributes them to branches according to demand.

Vendor-Managed Inventory (VMI) is an important coordination mechanism in Supply Chain Management (SCM), in which the supplier manages inventory according to agreed-upon quantities at specified retail locations [9]. The VMI system can reduce inventory levels and stockouts by using data retrieval systems [10]. Moreover, because the vendor manages inventory and demand under mutual agreements, both suppliers and distributors can maximize their benefits [11]. In this paper, logistics and distribution costs are reduced for a system comprising one manufacturer, five distribution warehouses, and four product types, while accounting for the problem's existing constraints. Due to internal company policies and confidentiality considerations, the names of products and distribution branches have not been disclosed in this study. The present study focuses on a two-echelon supply chain comprising a manufacturer and distribution branches and investigates the problem of distribution and logistics optimization. The primary objective of this research is to reduce logistics costs while ensuring the complete fulfillment of distribution centers' demand. To this end, a mathematical model has been developed that not only determines the optimal quantity of products to be distributed but also identifies the most appropriate type of transportation fleet. The proposed model not only reduces transportation costs but also achieves optimal product distribution. The case study in this research focuses on the distribution of products from the factory warehouse to various branches of a distribution company. The results from this model can support effective decision-making in logistics and distribution and help optimize supply chain operations. This research can also be applied to other industries and organizations facing similar SCM challenges.

2|Literature Review

One of the most important challenges for companies and organizations is decision-making in production and inventory planning. To date, various models for production and inventory control systems have been developed and discussed to address these issues, using different approaches and scenarios. Among traditional supply chain models, a dominant approach holds that each tier of the supply chain (e.g., suppliers, manufacturers, distributors, or retailers) is solely responsible for its own inventory and production control activities [12].

As a result of these conditions, each tier has access only to information on the inventory levels or demand of its immediate upstream and downstream neighbors. In particular, the downstream tier plays a leading role in this type of SCM system. In contrast, the upstream tier merely receives production order quantities and must fulfill orders in response to downstream requests. The upstream member perceives market demand only indirectly through the downstream tier's ordering activities. In fact, the supplier bears no responsibility for decisions regarding the buyer's order quantities or their consequences. *Fig. 1* illustrates a schematic representation of a traditional supply chain [13].

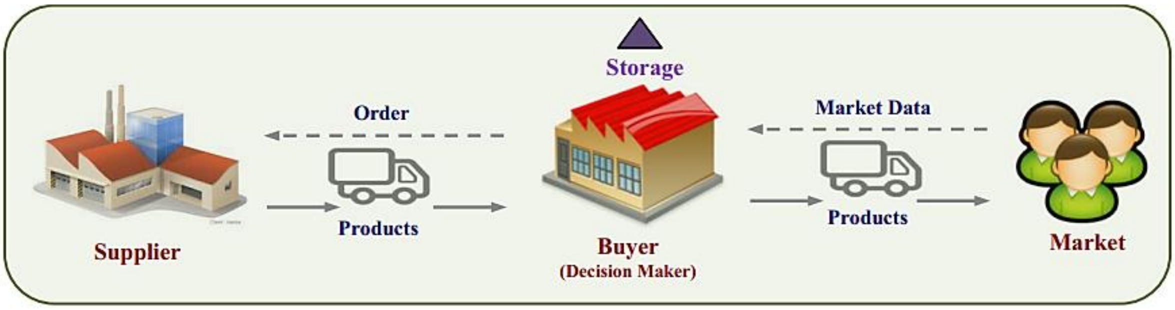

Fig. 1. Traditional supply chain structure [13].

This type of traditional relationship among the tiers of the supply chain led to various problems in traditional SCM. Consequently, many industries decided to share more information within the supply chain to improve overall supply chain performance [14].

VMI is an industrial approach in which the supplier manages the customer's inventory. Today, VMI is widely used and has contributed significantly to improvements in supply chain performance [15].

VMI is one of the mechanisms that have recently been employed as integration and coordination systems in SCM. Under VMI, the downstream entity (distributors) no longer manages its own production and inventory control system and instead delegates this responsibility to the upstream entity (supplier). Moreover, by implementing the VMI policy, the downstream entity allows the upstream entity to access demand and inventory information and to receive market data directly. Unlike traditional SCM approaches, upstream and downstream entities operate as a single unit under a VMI contract. They follow an agreed-upon policy that holds the upstream entity responsible for receiving demand data directly from the market and managing production and inventory policies at both upstream and downstream levels [13]. *Fig. 2* illustrates the supply chain structure under the VMI system.

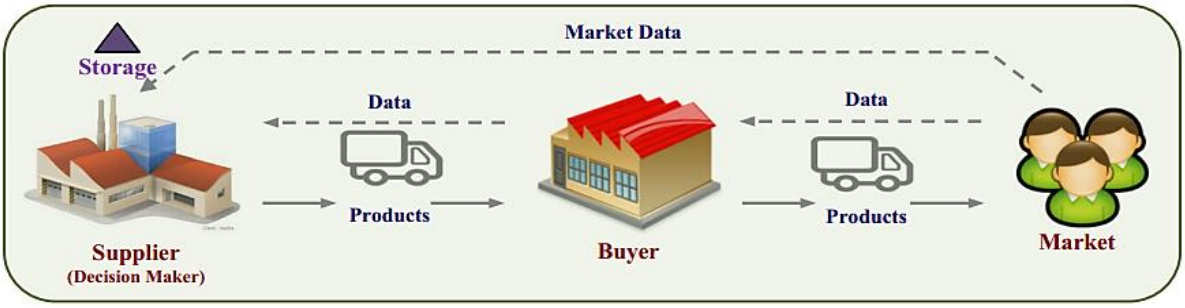

Fig. 2. VMI structure in the supply chain [13].

Subsequently, research on and application of this approach expanded. Although VMI was initially popular in the food sector, its applications have extended to other industries such as steel, publishing, and petrochemicals [16]. Disney and Towill [17] demonstrated that sharing demand and inventory information within a supply chain minimizes total supply chain costs while meeting customer service levels.

VMI is a widely implemented approach in supply chains that coordinates replenishment decisions among multiple buyers to reduce inventory-related costs [18].

SCM generally aims to reduce costs, improve customer satisfaction, and achieve a competitive advantage for all chain members. When decisions are made independently, there is no guarantee that the network members as a whole will reach an optimal decision. In integrated buyer–vendor optimization models, decision-making is centralized, and different components are integrated and coordinated [19].

Today, supply chains and production systems must be responsive, agile, and flexible to adapt to market changes and requirements. Globalization and intense market competition impose additional challenges on such systems and increase their complexity. One of the main objectives of SCM is coordinating different levels and related planning decisions, such as procurement, manufacturing, inventory management, and distribution [20]. Furthermore, because mutual agreements on inventory levels guide vendor, fill rate, and transaction costs, both suppliers and customers can maximize their benefits [11].

VMI is an industrial approach to supply chain collaboration in which the manufacturer assumes responsibility for customers' inventories and determines the timing and quantity of replenishment. Established in the late 1980s, VMI is now widely used and is considered one of the most successful approaches for enhancing supply chain integration [15]. VMI has been adopted by 84% of companies with revenues exceeding one billion dollars and by two-thirds of medium-sized companies [21]. This model, which emphasizes integration and coordination in SCM, involves VMI, where the supplier is responsible for monitoring and maintaining inventory levels at the customer's location. The model can reduce inventory levels, minimize associated costs, and prevent supply chain stockouts. In the VMI framework, inventory and routing decisions are optimized. The supplier must ensure that no stockouts occur for the customer while simultaneously minimizing total inventory and routing costs [22].

Over the years, various forms of VMI have been proposed. A model presented by Yao et al. illustrates how implementing VMI between a single supplier and a single buyer in a single-product setting can reduce supply chain costs [23]. In recent years, many researchers have attempted to extend VMI to more realistic conditions. Tarhini et al. [24] developed a model for a single supplier and multiple buyers under a VMI policy. Hariga et al. [25] proposed a VMI-based model for a supply chain consisting of a single supplier and multiple retailers, subject to environmental constraints, in a single-product setting. However, previous studies have not examined the role of transportation mode selection in reducing FMCG costs while ensuring that no warehouse experiences stockouts.

3 | Problem Statement

This study addresses the optimization of distribution and logistics in a two-echelon supply chain consisting of one manufacturer, five distribution warehouses, and four product types. Products are transported from the manufacturer's warehouse to distribution warehouses in different cities using two modes of transportation: single trucks and trailers. Transportation costs vary across cities, products, and transportation fleet types. The primary objective of this research is to prevent inventory shortages and ensure adequate product availability at all distribution warehouses, such that no warehouse experiences a stockout. At the same time, distribution activities are planned to reduce logistics costs by selecting appropriate transportation fleet types. The mathematical model developed in this study aims to provide an optimal distribution plan that accounts for differences in transportation costs per kilogram of product across cities, product types, and transportation fleets. In real-world conditions, the optimal product distribution problem is subject to various operational constraints. These constraints include unloading capacity at distribution branches, storage capacity at distribution warehouses, storage capacity at the manufacturing warehouse, transportation fleet capacity, and the satisfaction of branch demand. By minimizing total costs, the proposed mathematical model can provide an optimal decision-support solution for distribution and logistics planning. In practice, logistics systems must also account for heterogeneous transportation fleet capacities, varying fixed and variable transportation costs, and additional considerations such as penalty costs and delivery times [26]. In this research, a distribution model focused on reducing logistics costs is proposed

4 | Proposed Mathematical Model

In this study, an optimization model for product distribution is developed to minimize distribution costs by optimizing decisions on shipping products to different distribution branches. This model is particularly suitable for companies in the FMCG industry that face daily distribution challenges and substantial logistics costs. In this research, the model determines the following key decisions:

I. Selection of the type of transportation fleet.

II. Determination of the quantity of products to be distributed to each branch.

The proposed model reduces transportation costs by considering the operational and distribution-related constraints. In this section, the model's main parameters are presented and described.

4.1 | Assumptions of the Mathematical Model

I. Demand is assumed to be deterministic.

II. The holding cost is identical for all products.

III. According to the contract with the distribution company, a minimum inventory equivalent to ten days of sales must be maintained at each distribution center for every product.

IV. Vehicle capacity must be fully utilized.

Parameters

I: set of distribution centers

J: set of products

W: weight of products

T: type of transportation fleet

c_{jit} : transportation cost of shipping one carton of product j to distribution center i using fleet type t

s_{ij}: in-transit inventory of product j destined for distribution center i

q_j: total production quantity of product j

y_{ij}: inventory level of product j at distribution center i

k: storage capacity of the factory warehouse

l_{ij}: daily sales rate of product j at distribution center i

b_{ij}: number of cartons of product j stored in the factory warehouse

r_j: number of cartons of product j produced on the next day

n_i: storage capacity of the distribution center i

Decision variable

x_{ijt}: Quantity of product j distributed from the factory to distribution center i using fleet type t.

$$\text{Min } z = \sum_{i=1}^{n}\sum_{j=1}^{m}\sum_{t=1}^{k} c_{ijt} \times x_{ijt}. \tag{1}$$

Constraint

$$\sum_{t=1}^{k} x_{ijt} + s_{ij} + y_{ij} \geq 10 l_{ij}, \quad \text{for all } _j\epsilon\{1, \dots, m\}, \quad \text{for all } _i\epsilon\{1, \dots, n\}. \tag{2}$$

$$\sum_{j=1}^{m} x_{ij2} \times w_j = f_{i2} 22000, \text{for all } _i \in \{1, \dots, n\}. \tag{3}$$

$$\sum_{j=1}^{m} x_{ij1} \times w_j = f_{i1} 10000, \text{for all } _i \in \{1, \dots, n\}. \tag{4}$$

$$\sum_{j=1}^{m}\sum_{t=1}^{k} x_{ijt} + \sum_{j=1}^{m} s_{ij} + \sum_{j=1}^{m} y_{ij} - \sum_{j}^{m} l_{ij} \leq n_i, \quad \text{for all}_{\ i=1,\ldots,31}. \tag{5}$$

$$\sum_{j=1}^{m} q_j + \sum_{j=1}^{m} b_j + \sum_{j=1}^{m} r_j - \sum_{i=1}^{n}\sum_{j=1}^{m}\sum_{t=1}^{k} x_{ijt} \leq k_j, \tag{6}$$

$$\sum_{i=1}^{n}\sum_{t=1}^{k} x_{ijt} \leq q_j + b_j, \quad \text{for all}_{\ j} \in \{1, \ldots, m\}. \tag{7}$$

$$x_{ijt} \geq 0. \tag{8}$$

$$x_{ijt} \in \text{int}. \tag{9}$$

$$f_{i2}, f_{i1} \in \text{int}. \tag{10}$$

The objective function focuses on minimizing transportation costs to reduce the per-kilogram cost. This cost reduction ultimately reduces overall transportation expenses. This argument is achieved through the optimal selection of the vehicle type and the precise planning of the distribution of goods. Choosing the appropriate fleet type and allocating resources optimally improve the efficiency of the transportation system and enable the economic and efficient distribution of goods. *Constraint 2* states that the total number of cartons shipped to a branch, the branch's current inventory, and the inventory in transit must be greater than or equal to the branch's ten-day consumption. This constraint ensures that no branch faces a shortage of goods and that the branch's daily requirements are fully met. According to the contract between the distribution branches and the manufacturing plant, each product must be stocked in the branch warehouse for at least ten days of consumption.

Constraints 3 and *4* ensure that the quantity of goods shipped to each destination corresponds to the vehicle's capacity. These constraints consider the transportation fleet's capacity and ensure that each vehicle is fully loaded and its capacity is used optimally. *Constraint 5* considers the branch's storage capacity and ensures that the quantity of goods shipped plus the branch's inventory does not exceed the branch's warehouse capacity. This argument helps optimize inventory management and prevents idle capital or overstocking at the branch. *Constraint 6* accounts for the factory's warehouse capacity and ensures that goods and inventory do not exceed the defined capacity. *Constraint 7* ensures that the total quantity of goods shipped for each product does not exceed the sum of the produced goods and the remaining inventory in the warehouse.

5 | Numerical Experiment Results

In this paper, we examined the impact of vehicle type on logistics costs in a VMI-based supply chain. The analyses indicate that selecting an appropriate transportation fleet can significantly reduce transportation costs, particularly logistics costs. According to the proposed model, optimal load distribution across branches not only reduces transportation costs but also improves the supply chain's overall efficiency. By adjusting distribution and optimizing the use of different vehicles' capacities, additional costs can be avoided. For example, choosing heavier, higher-capacity vehicles for longer distances typically reduces costs, while for shorter distances, lighter vehicles may be a better option. These choices are also optimized by considering the specific characteristics of each distribution branch. The model developed in this study was solved using LINGO. The problem is an integer programming type designed to achieve optimal distribution and cost reduction. The solution process took less than 1 minute, demonstrating the model and software's high efficiency in analyzing and finding the optimal solution. The results show that the proposed model is effective not only in reducing costs but also in delivering an efficient, practical solution. The findings of this study can help logistics and supply chain managers make better decisions about selecting the type of transportation fleet and distributing loads, thereby improving overall supply chain performance and reducing costs. Previous studies in this area have mostly focused on reducing logistics costs, but, in the context of fast-moving goods and transportation optimization, they have not addressed the problem as presented in this research. In this study, a real-world industrial problem has been modeled to analyze the specific conditions and complexities of a real supply chain. This approach ensures that the results obtained from the proposed model have greater practical applicability and can be implemented in real systems. The results of the model solution are presented in *Table 1*. In the proposed model, branch demand is assumed fixed, but the model can be extended to account for probabilistic demand. The model considers one factory, five distribution branches, and four product types; to extend this model, the number of factories, distribution branches, and product types can be increased.

Table 1. Model solution results.

Description	Value
Solution type	Global optimal
Model type	Integer linear programming
Number of iterations	2,791
Solution method	Branch and bound
Number of variables	50
Time	Less than one second
Objective function value	3.21357×108
Number of model stages	267
Number of constraints	43

Table 2 shows the number and type of fleet for different branches. For Branch 3, which has a significant difference in the ratio of trailer costs to single-truck costs and is the largest in terms of operational volume, five trailer fleets were used to meet demand for more products and achieve cost savings. *Table 3* shows the number of shipping cartons for each product separately.

Table 2. Fleet type and quantity.

Branch Name	Vehicle Type
Branch 1	Two trailers, one single-axle truck
Branch 2	Two trailers, one single-axle truck
Branch 3	Five trailers
Branch 4	Two trailers, one single-axle truck
Branch 5	Two trailers, one single-axle truck

Table 3. Number of products distributed.

Branch	Product 1	Product 2	Product 3	Product 4
Branch 1	1,230	900	2,500	200
Branch 2	960	500	1,770	1,600
Branch 3	4,150	4,500	500	600
Branch 4	630	1,600	1,400	1,200
Branch 5	4,330	260	60	180

6 | Conclusion

This study addresses the optimization of distribution and logistics in a two-level supply chain consisting of one manufacturer, five distribution warehouses, and four types of fast-moving consumer products. Products are transported from the factory to warehouses in different cities using two types of transportation fleets (single trucks and trailers), with transportation costs varying by city and fleet type. The model aims to prevent warehouse inventory shortages and reduce logistics costs by optimizing fleet selection. By accounting for constraints such as warehouse capacity, fleet capacity, and demand fulfillment, the model provides a practical approach to reducing costs and improving decision-making in distribution. In this research, a VMI-based transportation optimization model was designed and implemented to reduce logistics costs in the supply chain. The results indicate that selecting the right vehicles can significantly reduce costs and improve supply chain efficiency. In particular, the proposed model, based on per-kilogram transportation cost analysis and load distribution optimization across branches, reduces overall system costs. In the model, single trucks, which are more cost-effective for nearby cities, were used to fully meet the needs of all branches. For distant cities, trailer fleets, which are more economical than single trucks, were deployed, and the model correctly applied this allocation while considering distribution constraints. The use of LINGO software to solve the problem demonstrated that the proposed model not only finds optimal solutions quickly but also effectively reduces costs and is feasible for real-world implementation. These characteristics make the model a practical and operational tool for supply chain and logistics managers.

References

[1] Hasanpour Jesri, Z. S., Hassannayebi, E., & Abolghasemian, M. (2024). Optimization models for vehicle routing problems with simultaneous delivery and pickup under time window constraints. *Journal of operational research and its applications*, *21*(2), 35–55. (**In Persian**). http://dx.doi.org/10.71773/jamlu-2024-1-2220

[2] Kheiri, A. O., Abolghasemian, M., Saberi Fard, N., Davoodi, H., & Pourghader Chobar, A. (2025). Identifying and ranking factors affecting the performance and flexibility evaluation of the digital supply chain system in Khoshgovar Company. *Journal of operational research and its applications*, *22*(4), 67-81. (**In Persian**). http://dx.doi.org/10.71773/jad-2025-1-2275

[3] Samieifard, M., Abolghasemian, M., & Pourghader Chobar, A. (2024). The impact of innovation, performance, and e-commerce development in the online shop on online marketing: A case study in the industry. *Interdisciplinary journal of management studies*, *18*(1), 1–17. https://doi.org/10.22059/ijms.2024.358619.675818

[4] Ghasemi, P., Ali, S. M., Abolghasemian, M., Malakoot, R. A., & Chobar, A. P. (2025). A stochastic sustainable closed-loop supply chain networks for used solar photovoltaic systems: Meta-heuristic comparison and real case study. *Sustainable operations and computers*, *6*, 15–33. https://doi.org/10.1016/j.susoc.2024.11.001

[5] Hemmati, A., Kaveh, F., Abolghasemian, M., & Pourghader Chobar, A. (2024). Simulating the line balance to provide an improvement plan for optimal production and costing in petrochemical industries. *Engineering management and soft computing*, *10*(1), 190–212. https://doi.org/10.22091/jemsc.2024.11189.1198

[6] Imeni, M., & Sorourkhah, A. (2023). Procrustes' bed metaphor; understanding the problem of creativity and innovation in the human resources of Iran's state-owned enterprises. *Innovation management and operational strategies*, *4*(3), 208–218. https://doi.org/10.22105/imos.2022.364479.1253

[7] Bayatzadeh, S., Talaie, H., & Sorourkhah, A. (2024). Analyzing the quality of digitalization in supply chain collaboration models using an integrated fuzzy BWM-TOPSIS approach. *Journal of quality engineering and management*, *14*(3), 224-243. (**In persian**). https://doi.org/10.48313/jqem.2025.516446.1513

[8] Joorbonyan, Z., Sorourkhah, A., & Edalatpanah, S. A. (2024). Identifying and prioritizing appropriate strategies for customer loyalty in a mass environment (case study: Clothing house). *Journal of decisions and operations research*, *9*(1), 98-119. (**In Persian**). https://doi.org/10.22105/dmor.2024.420185.1800

[9] Aviv, Y., & Federgruen, A. (1998). *The operational benefits of information sharing and vendor managed inventory (VMI) programs*. Olin School of Business Working Paper.

[10] Angulo, A., Nachtmann, H., & Waller, M. A. (2004). Supply chain information sharing in a vendor managed inventory partnership. *Journal of business logistics*, *25*(1), 101–120. https://doi.org/10.1002/j.2158-1592.2004.tb00171.x

[11] WANG, C. (2009). Random yield and uncertain demand in decentralised supply chains under the traditional and VMI arrangements. *International journal of production research*, *47*, 1955–1968. https://doi.org/10.1080/00207540701666220

[12] Sadeghi, J., Sadeghi, S., & Niaki, S. T. A. (2014). Optimizing a hybrid vendor-managed inventory and transportation problem with fuzzy demand: an improved particle swarm optimization algorithm. *Information sciences*, *272*, 126–144. https://doi.org/10.1016/j.ins.2014.02.075

[13] Mokhtari, H., & Rezvan, M. T. (2020). A single-supplier, multi-buyer, multi-product VMI production-inventory system under partial backordering. *Operational research*, *20*(1), 37–57. https://doi.org/10.1007/s12351-017-0311-z

[14] Lin, K. P., Chang, P. T., Hung, K. C., & Pai, P. F. (2010). A simulation of vendor managed inventory dynamics using fuzzy arithmetic operations with genetic algorithms. *Expert systems with applications*, *37*(3), 2571–2579. https://doi.org/10.1016/j.eswa.2009.08.020

[15] Ghasemi, E., Lehoux, N., & Rönnqvist, M. (2024). A multi-level production-inventory-distribution system under mixed make to stock, make to order, and vendor managed inventory strategies: An application in the pulp and paper industry. *International journal of production economics*, *271*, 109201. https://doi.org/10.1016/j.ijpe.2024.109201

[16] Disney, S. M. &, & Towill, D. R. (2003). The effect of vendor managed inventory (VMI) dynamics on the Bullwhip Effect in supply chains. *International journal of production economics*, *85*, 199–215. https://doi.org/10.1016/S0925-5273(03)00110-5

[17] Disney, S. M., & Towill, D. R. (2002). A procedure for the optimization of the dynamic response of a vendor managed inventory system. *Computers & industrial engineering*, *43*((1-2)), 27–58. https://doi.org/10.1016/S0360-8352(02)00061-X

[18] Yu, Y., Hong, Z., Zhang, L. L., Liang, L., & Chu, C. (2013). Optimal selection of retailers for a manufacturing vendor in a vendor managed inventory system. *European journal of operational research*, *225*(2), 273–284. https://doi.org/10.1016/j.ejor.2012.09.044

[19] Karimpoor, M., Nasiri, G. R., & Monabbati, S. E. (2023). Production, distribution, and capacity planning for an integrated buyer-vendor system incorporating different production and shipping scenarios. *Computers & industrial engineering*, *184*, 109545. https://doi.org/10.1016/j.cie.2023.109545

[20] Andres, B., Sanchis, R., Lamothe, J., Saari, L., & Hauser, F. (2017). Integrated production-distribution planning optimization models: A review in collaborative networks context. *International journal of production management and engineering*, *5*(1), p-31. https://dx.doi.org/10.4995/ijpme.2017.6807

[21] Fang, X., So, K. C., & Wang, Y. (2008). Component procurement strategies in decentralized assemble-to-order systems with time-dependent pricing. *Management science*, *54*(12), 1997–2011. https://doi.org/10.1287/mnsc.1080.0934

[22] Laganà, D., Malaguti, E., Monaci, M., Musmanno, R., & Paronuzzi, P. (2024). An iterated local search matheuristic approach for the multi-vehicle inventory routing problem. *Computers & operations research*, *169*, 106717. https://doi.org/10.1016/j.cor.2024.106717

[23] Yao, Y., Evers, P. T., & Dresner, M. E. (2007). Supply chain integration in vendor-managed inventory. *Decision support systems*, *43*(2), 663–674. https://doi.org/10.1016/j.dss.2005.05.021

[24] Tarhini, H., Karam, M., & Jaber, M. Y. (2020). An integrated single-vendor multi-buyer production inventory model with transshipments between buyers. *International journal of production economics*, *225*, 107568. https://doi.org/10.1016/j.ijpe.2019.107568

[25] Hariga, M., As'Ad, R., & Ben-Daya, M. (2022). Vendor managed inventory coordination under contractual storage agreement and carbon regulation policies. *IEEE access*, *10*, 66098–66112. https://doi.org/10.1109/ACCESS.2022.3183988

[26] hong Zhao, Q., Chen, S., Leung, S. C., & Lai, K. K. (2010). Integration of inventory and transportation decisions in a logistics system. *Transportation research part e: logistics and transportation review*, *46*(6), 913-925. https://doi.org/10.1016/j.tre.2010.03.001