

Research

Executive summaries of IIE Transactions and IIE Transactions on Occupational Ergonomics and Human Factors

Edited by Ronald Askin and Ling Rothrock

This month we highlight two articles focusing on logistics. The first article addresses the use of regional 3PL services for delivering periodic orders from warehouses to retail outlets. A mutually agreeable fee table is needed for pricing deliveries. The second article looks at routing pickups and deliveries in the nonprofit sector where a food bank wants to distribute donations to its client agencies equitably and at minimum distribution cost. These articles will appear in the December 2014 issue of IIE Transactions (Volume 46, No. 12).

A fair day's pay for your logistics partners

To meet the demanding product delivery requirements of large retailers, manufacturing companies are partnering with regional third-party logistics (3PL) providers for "last echelon" distribution from the company's warehouses or distribution centers (DCs) to retail stores.

Logistics managers at these companies face the important issue of deciding how much to pay the 3PL providers for their delivery services. Motivated by this problem that a building products manufacturer was facing, the article "Designing Delivery Fees for Retail Delivery Services by Third-Party Logistics Distributors" by Anant Balakrishnan of the University of Texas at Austin and Hari Natarajan of the University of Miami, Coral Gables, develops an optimization model to determine a fair and equitable delivery payment scheme.

The manufacturer relies on regional 3PL companies to pick up ordered items from the distribution center and periodically deliver to retail stores. The weight of products ordered varies with each delivery, but is less than a full truckload. Following common payment practice in the less-than-truckload (LTL) freight transport industry, the companies agreed to use a fee table that specifies, for various ranges of DC-to-store distances and delivery weights, the amount to be paid to the 3PL company for each delivery.

The freight rates from commercial LTL rate tables do not directly apply because these tables typically assume occasional transport of smaller weight packages over long distances. In contrast, this manufacturing company commits to a long-term partnership with the 3PL providers for periodic deliveries.

So the main fee table decisions facing the company are what weight and distance ranges to use and how much the regional 3PL providers should be paid for each range combination.

This article provides an operational tool for setting fees by framing the problem as an optimization model. The mixed-integer program considers the distance of each store from the distribution center, the probability distribution of delivery weights to each store, and the total delivery cost incurred by each 3PL provider. The authors tailor a solution procedure that exploits the problem's structure to strengthen the model formulation and also obtain good optimization-based heuristic solutions.

When applied to actual data from the building products manufacturer, the model and methodology was able to determine a fair and more equitable fee structure than the previous manually chosen table, while also reducing the manufacturer's distribution costs. The paper provides a rigorous and systematic approach to support negotiations between companies and their 3PL service providers in retail distribution and other supply chain contexts.



CONTACT: Anant Balakrishnan; anantb@mail.utexas.edu; (512) 471-5216; McCombs School of Business, 1 University Station B6500, Austin, TX 78712