An Investigation of the Value of Cross-Docking for Supply Chain Management
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Cross-docking is a strategy used to reduce the time that inventory spends in the supply chain. This is achieved by accelerating inventory flow via the receipt of a product at an inbound dock and immediately moving that product crossdock for outbound shipment. The strategy has been used by companies such as Wal-Mart and Nabisco Inc. to improve their customer service.

Examples of cross docking methods include hub and spoke, consolidation and deconsolidation arrangements. In this paper the authors focus on deconsolidation, specifically the case where truck load (TL) shipments containing multiple orders are split into smaller quantities for delivery to individual customer sites using less-than-truckload (LTL) carriers. Figure 3 illustrates the scenario being considered.

The value of cross-docking is in its potential to eliminate both storing and picking, two of the most expensive operations in traditional warehousing. Reducing product storage can increase inventory turns, thus reducing inventory carrying costs and speeding the flow of products to the customer. Fewer inventories can also mean less space, equipment, and labor required for handling and storing the products, as well as a reduced risk of product damages and obsolescence. While the benefits of cross-docking make it an attractive option for supply chain managers, the operating conditions under which it most beneficial are not always clear.
Numerous considerations need to be examined to determine when cross-docking makes sense given the available shipping alternatives and relevant costs. In this paper the authors develop a model that allows insights to be gained into the situation which cross-docking provides the most value for supply chain managers. A key component of the model is the use of accurate LTL costs which follow a modified all-unit discount.

The model is analyzed from the customer’s perspective: the manager of multiple customer locations must determine the quantity, timing and route for shipments to meet demands over the planning horizon. The customer can choose the shipping mode i.e. TL or LTL and is responsible for all transportation costs. Simulation was used to determine the cost savings when cross-docking is employed. A sample result is shown in the figure below:

**INTERACTION OF CV OF DEMAND AND HOLDING COST**

The results suggest that cross-docking is more valuable when demands are less variable or unit holding costs are high. Cross-docking is less valuable when mean demands are closer to TL capacity. However, further analysis performed in the paper found that when holding costs and mean demands are relatively low, cross-docking is more beneficial with high demand variability. Possible reasons for this are discussed in the paper. One implication of the results is that supply chain managers should not assume that smoother demands make a stronger case for cross-docking, but rather depending on the other characteristics of the supply chain, smoother demands might actually indicate a lower value of cross-docking. Other implications are discussed in the full article.