

Public Abstract

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For more than twenty years, shipment consolidation has been utilized as a method to significantly decrease transportation costs of shipping goods, people, and information. Due to ever-increasing fuel costs and customer expectations, consolidation strategies are becoming even more important.

The hub-and-spoke model has also been widely recognized as an effective design for shipment consolidation. Shipment consolidation takes advantage of transportation economies of scale by gathering shipments from clustered origins around a central location, called a hub, transporting them in bulk to other hubs, and distributing them to clustered destinations.

This research proposes mathematical models and solution methodologies that determine an effective, and potentially optimal, network for the consolidation of less-than-truckload (LTL) shipments, shipments that are traditionally transported individually by commercial trucking.

Data from a Fortune-500 manufacturing company in the U.S. describing a domestic LTL network has been provided as a case example for the proposed methods. Eight scenarios are identified to decrease transportation costs when compared to strict LTL shipping.

The value of this research is in designing the consolidation network for the manufacturing company, or service user, as opposed to the service providers, large commercial carriers. Past research has neglected opportunities for consolidation of rather sparse shipment quantities, as opposed to saturated shipping networks of large commercial trucking companies.