

SHIPMENT CONSOLIDATION AND DISTRIBUTION MODELS
IN THE INTERNATIONAL SUPPLY CHAIN

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ABSTRACT

With the increasing competition in global trade, buying and transporting items effectively in the international network are critical and challenging problems for many companies. The objective of this study is to design a cost-effective consolidation and distribution method to transport shipments in a global network.

In the dissertation, we investigate an integrated consolidation problem in the international supply chain, where a US manufacturing company buys multiple items from China. A proactive order consolidation strategy is proposed. Different from current practices, our approach consolidates items in China considering inland transportation in US. This strategy is modeled to minimize the total costs by effectively loading items into an ocean container considering subsequent inland transportation cost and handling cost given container capacity and packing constraints. Two difficult combinatorial optimization problems, such as a mode selection problem and a three-dimensional bin packing problem, are combined into the model. Due to the problem complexity, approximation algorithms are proposed to solve the model. The basic model is extended to consider the inland multi-stop delivery and multi-period planning horizon. Several solution methodologies are developed and evaluated to solve large-scale problems. Based on the numerical results, it is observed that our proposed methods could achieve up to 30% cost savings compared with the current shipping practices. The algorithms we developed could obtain the good implementable solution in a reasonable time for real-world problems.