Demonstration of Global Supply Chains with Intermodal Transportation and Decision Support for Small and Medium Business


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Project Funding

National Center for Intermodal Transportation: $53,233
Total Funding: $53,233

Project Objective

The objective of this research is to develop a model with geospatial information to simulate a typical global supply chain faced by a small/medium business in the United States for professional training, academic education, and decision support. The model will include three transportation modes, ocean steamship lines, railways, and highways along a global supply chain from overseas suppliers to the company and then to final customers. The model is expected to visually display the impact of intermodal transportation on global supply chain management and serve as an educational tool to help small/medium business and college students understand intermodal transportation and global supply chains. The model can be tailored for one specific company and provide decision support for evaluating different supply chain alternatives and conduct trade-off study.

Project Abstract

To promote intermodal transportation in small/medium business, this project will develop a simulation model for a typical global supply chain faced by small/medium business. The chain includes maritime transportation, railways and highways. The model will incorporate the operational data collected from local manufacturing companies and third-party logistics providers and relative geospatial information. The simulation model will include major steps and issues in all three transportation modes and their connections. The developed simulation model will be used in professional training to small and medium sized manufacturing companies and in transportation undergraduate education to introduce intermodal transportation and global supply chain. The results will be further
disseminated through journal papers and conference presentations. The developed model will be able to be tailored for a specific company to evaluate their supply chain alternatives.

**Intermodal Orientation of the Project**

Three major transportation modes are involved in this project: waterway, railway and highway. These three modes have to be studied together in order to coordinate a global supply chain. The project affects freight transportation. The project is related to transportation improvement and assessment.

**Task Description**

Task 1. Literature Review: The research team will conduct a comprehensive literature review of intermodal transportation issues in global supply chain management for small and medium sized companies. Simulation languages and capability related to this project will also be reviewed.

Task 2. Data Collection: The research team will meet with small manufacturing companies in Mississippi and third-party logistics companies. The team will collect operational data and identify major performance measures and issues involved in global supply chains for small and medium business. The lead times, cost structures, their variability, and other data for each transportation mode and the connection information between modes will be collected.

Task 3. Model Development: The discrete-event simulation model will be developed to demonstrate the global supply chain with intermodal transportation. The model will incorporate the data collected in Task 2 and relative geospatial information. The model is expected to have the flexibility to conduct what-if analysis.

Task 4. Demonstration, Verification and Dissemination: The developed simulation model will be demonstrated to small and medium sized manufacturing companies and third party logistics companies. Modification may be necessary based on the feedbacks from the demonstration. The model will be presented to the Franklin Furniture Institutions and Mississippi Manufacturing Extension Partnership program. They are expected to use the model to provide professional training to small and medium sized companies and promote intermodal transportation. The model will also be used to introduce intermodal transportation and global supply chains to undergraduate students in the Civil Engineering course of CE 3113 Transportation Engineering. The model and results will be summarized in the final report and developed into journal papers.

**Technology Transfer**

The simulation model will be presented to local small/medium business. The model and other research results will be provided to the Franklin Furniture Institutions and Mississippi Manufacturing Extension Partnership program (MEP), which serves small/medium manufacturing companies, for the training purpose. The model can be tailored for specific companies to analyze their logistics operations. Two journal or conference papers are expected out of this project. One is to discuss major intermodal
transportation issues in global supply chains for small and medium size companies. The other paper is to introduce the simulation model. The papers will be submitted to Transportation Research Board and Transportation Research Record.

**Benefits of Project**
The globalization has exposed all companies, large or small, to global competition and cooperation (Hayward et al. 2007). In the United States, even a small local manufacturing company may receive raw materials, parts, subassemblies, or even finished goods from oversea suppliers and may ship their products to customers in other countries. A long supply chain across borders typically involves multiple transportation modes (Smith et al. 2002). Unlike big companies, a small/medium business typically does not have experience and expertise about how to manage a global supply chain and even does not understand the complications of a global supply chain and involved intermodal issues along the chain. They typically depend on third party logistics providers (Navas 2005). In several on-going projects, the PI has been studying the supply chain performance of Mississippi furniture companies. Most of these companies are small-medium business. The PI found that these companies do not understand different transportation modes and their impact on their operations. They tend to apply their limited experience gained from highways to other modes. They also do not know how to align their ordering and other business operations with intermodal transportation for improving the whole supply chain performance. There are needs to visually display a typical global supply chain including multiple transportation modes and highlight major issues along the chain. The proposed simulation model is expected to serve as an educational and training tool. The simulation model can also be used as a decision making tool to evaluate and analyze alternatives of supply chain design and operations with multiple transportation modes.