DESIGNING RESILIENT SUPPLY CHAINS UNDER POSSIBLE JOB ACTIONS

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Research on supply chain risk management primarily deals with minimizing operational risks such as uncertainty in demand, uncertainties in supply lead times, and the like. Disruptive risks caused by natural disasters, labor disputes, terrorism, and the like are less studied. These require the design of resilient supply chains. The West Coast dockworkers lockout in 2002 and the labor event of 2014/2015 caused disruptions that were partially resolved by building inventories. This approach is only effective for low cost items, when the disruption is imminent or when disruptions can be predicted with reasonable confidence.

This presentation reports the results of a study whose aim is to develop quantitative decision models to assist management decision making in response to possible job actions by labor unions and terminal operators in the west coast seaports of the United States. Decision makers have various courses of action in the face of varying degrees of uncertainty related to potential dockworker labor actions. This is not a hypothetical scenario; labor actions took place in 2002, followed by a major disruption in late 2014 and early 2015. Both situations generated painful economic consequences. The courses of action available to decision makers include use of airfreight (a roughly 10 times more expensive transportation mode); use of alternate seaports in Canada or Mexico (with considerable additional transshipment costs); and use of gulf coast and eastern ports via Panama Canal and/or build-up of inventory (necessitating adjustment in the production plans of the manufacturers and related inventory holding costs).

When researchers consider the multi-item, stochastic and dynamic nature of integrated production, transportation and distribution systems, the intractable nature of the problem becomes clear. In the presentation, a possible modeling approach will be presented. It is possible to analyze various scenarios using a spreadsheet-based optimization model. Use of this model as a decision support tool is illustrated with sample computational results.