Towards Flexible Production-Distribution Networks under Disruptions

Walid Klibi*[1,2] and Atidel B. Hadj-Alouane[3]

[1]Centre Interuniversitaire de Recherche sur les Réseaux d'Entreprise, la Logistique et le Transport (CIRRELT) – Pavillon André-Aisenstadt, bureau 3520 2920, Chemin de la Tour Montréal (Québec) H3T 1J4 CANADA, Canada

[2]KEDGE Business School – Ministère de l'Enseignement Supérieur et de la Recherche Scientifique – 680, Cours de la Libération, 33405 Talence Cedex, France

[3]Unité de Recherche Optimisation et Amélioration des Systèmes Industriels et des Services (OASIS) – BP 37, LE BELVEDERE 1002 TUNIS, Tunisie

Résumé

Companies today face a complex global business environment, characterized mainly by longer and more variable transportation delays; larger number of suppliers, more volatile demand; and more exposure to high-impact disruptive events - a situation that requires organizational flexibility and operational responsiveness that is not necessarily available in all current supply chain systems. It is to cope with these issues that companies must adapt the structure of their production-distribution networks and planning systems. This research proposes an approach for modeling the problem at the strategic level with the objective of enhancing the flexibility of the production-distribution system. It considers that future business environment is prone to disruptions (industrial accidents, epidemics or natural disasters) that could reduce the production and distribution capacities of the network and that can also suddenly raise products demand. In addition, it takes into account the option to consider new flexible production technologies providing modularity capabilities and more process responsiveness. The mathematical model builds on stochastic programing to consider uncertainty into a set of scenarios and on the concepts of chaining and multiple sourcing to foster flexibility. This gives rise to a two-stage stochastic location-allocation model with multiple products and capacitated production features, and where the decisions include technology and facilities mission selection.

Mots-Clés: Production Network Design, Network Disruptions, Two, stage Stochastic Programming, Flexibility

*Intervenant