

A Framework for Coordinated Sustainable Product and Supply Chain Design

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Abstract

Promoting sustainability in business operations requires sustainable products, processes and systems, i.e., supply chains (SCs). To achieve sustainability in SCs, with a triple bottom-line (TBL) emphasis on economic prosperity, environmental protection and societal well-being, it is necessary that products, processes and systems are designed and managed from a total life-cycle perspective. In addition, it is essential to consider integration between products, processes and systems. The design of a product determines all of its future costs; both forward and reverse flow and these in turn depend on/influence the SC configuration. Therefore, coordinating sustainable product design and SC design decisions requires the application of a closed-loop SC perspective and a TBL analysis. This paper will present an approach to model and evaluate coordinated sustainable product and SC design decisions. Alternate product designs and corresponding SC configurations (in terms of capacity, capability, locations, etc.) will be assessed from a TBL perspective. A hierarchical approach to selecting the best product and SC design combination is presented.

Keywords: Sustainable supply chains, Sustainable products, Optimization, Coordinated design