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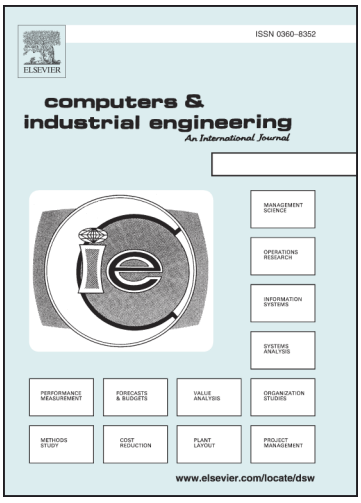

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Integrated Production-Distribution Planning Problem in a Competition-Based Four-Echelon Supply Chain

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Abstract:

Integrated production-distribution (P-D) planning reduces costs, enhances the efficiency of the supply chain, and reduces additional proceedings because of its integrated parts and activities. P-D planning facilitates simultaneous planning of supply chain constituents in order to save more time in planning within a supply chain. Therefore, it plays an important role in supply chain management (SCM). Besides, since the introduction of competition into SCM, it has attracted the attention of many researchers and practitioners. The present work was conducted to investigate an integrated P-D planning problem within a four-echelon supply chain with two main objective functions: minimizing total chain cost and maximizing service level. The considered problem is modeled under two circumstances; no competition and competitive market. In the latter, three kinds of competitions are taken into account: Cournot, Stackelberg, and Quality competitions. To tackle the problem, two mixed integer linear programs (MILPs) are developed, which are proved to be unimodular. Moreover, elastic constraint method is used to solve the two multiobjective models. Finally, numerical experiments are conducted. The results showed that although competition improves chain performance in terms of quality of the delivered products, it might also raise the cost of the chain.

Keywords: competition; supply chain; elastic constraint method; integrated production-distribution (PD) planning; multiobjective optimization; totally unimodular

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