Design approach for additive manufacturing in spare part supply chains

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Abstract-

In the current industrial revolution, additive manufacturing (AM) embodies a promising technology that can enhance the effectiveness, adaptability, and competitiveness of supply chains (SCs). Moreover, it facilitates the development of distributed SCs, thereby enhancing product availability, inventory levels, and lead time. However, the wide adoption of AM in industrial SCs creates various challenges, leading to new difficulties for SC design. In this context, this article proposes a new design approach to AM SCs using optimization methods. More specifically, the proposed approach, comprising the p-median and mixed-integer linear programming models, considers the decision of deploying productive resources (3-D printers) in specific locations of generic spare part SCs. The approach was evaluated in a real-world use case of an elevator maintenance service provider. The obtained results demonstrated the promising capabilities of the proposed design approach in managing the challenges arising from the forthcoming widespread use of 3-D printers in manufacturing SCs.

Index Terms- Additive manufacturing (AM) supply chain, location-allocation, make-to-order (MTO), mixed-integer linear programming (MILP), p-median, supply chain design.

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