Development of Solution Methodologies for Online Order Fulfillment in Omnichannel Retailing

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Abstract

Over the last few decades, retailing has gone through paramount of transformations and is moving towards omnichannel retailing for integrating store-based and online retailing. However, store-based retailers have apprehensions about omnichannel retailing because of high fulfillment cost and low profitability for online orders. This paper addresses a new problem of online order fulfillment in omnichannel environment considering fulfillment options such as from store, fulfillment center, direct-to-customer center and vendor. Particularly we address fulfillment, delivery, sourcing, inventory, shipping and fixed costs by proposing a mixed-integer profit maximization model, which is tested on small instances. For large scale randomly generated instances, we use Bender's decomposition to provide near optimal solution. The model assesses fulfillment decisions over multiple time periods to determine inventory needed to be shipped from vendor from different locations in retailer's system. These product flow decisions in turn affect how much online demand that can be fulfilled profitably. In addition to the prime objective of profit maximization, the proposed model incorporates a lost-sale penalty towards balancing two conflicting requirements of profit maximization and lost sale minimization and to ensure long term customer relationship. Finally, managerial insights are developed by evaluating operational and logistics cost and profitability for different fulfillment options.

Keywords : Omnichannel Retailing, Online Order fulfillment, Mixed Integer Programming, Omnichannel Decision Making

Biographies

Kosha Joshi is currently a Research Scholar in the Department of Management Studies at Indian Institute of Science, Bengaluru, India pursuing his research in Omnichannel Retailing. She has a bachelor's degree (B.E.) in Electronics and Telecommunication Engineering from University of Mumbai, Mumbai, India. Subsequently, she pursued PGPM (MBA equivalent) from S. P. Jain Institute of Management and Research, Mumbai, India. She has total eight years of work experience as a software developer and pre-sales consultant for supply chain solutions.

M.Mathirajan obtained his PhD in Operations Management and MS degree by research in Applied Operations Research (OR) from IISc, Bangalore. He also received his MSc in Mathematics from Madurai Kamaraj University and Postgraduate Diploma in OR from College of Engineering, Guindy, Anna University. He has been working as faculty of IISc Bangalore since 1986 and currently serving as a Chief Research Scientist since 2013. He is a Fellow of Operational Research Society of India (FORSI). His areas of research interest include mathematical/heuristic optimization and research methods for operations and supply chain management, sequencing and scheduling, personnel scheduling, routing and scheduling of logistics, urban road transport, and container terminal logistics problems