Omni-Channel Fulfillment Models

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Abstract

The advancement of technology has changed the ways customers interact with retailers. Customers are now empowered with more choices than ever before. For instance, they can choose how to place their orders (e.g., online, in store) and can also choose where they would like to receive the products (e.g., at home, in store). Omni-channel retailing is a recent approach that allows customers to purchase products from anywhere and return them anywhere and allows retailers to fulfill orders from anywhere. This flexibility offered by omni-channel retailing improves the customer experience by integrating all channels, allows retailers to achieve more availability and drives the sales and traffic of the retailers. However, it also puts extremely high pressure on retailers to align their operations in an efficient manner and to get products faster to customers. Two omni-channel fulfillment implementations that can offer benefit for the retailers are ship-from-store and home delivery. Ship-from-store allows retailers to fulfill online orders from brick-and-mortar stores, rather than from fulfillment centers (FCs). Home delivery allows customers to place their orders in store and receive them at home. Customers now use various sales channels including traditional store visits, websites, mobile-phone apps in their purchase processes. As a result, retailers are challenged with customers who are prone to switch across the retailers' sales channels. Ideally, omni-channel retailing, described as a retailer's efforts to provide customers a consistent, coordinated shopping experience across all available shopping channels, should enable customers to shop in a seamless manner across the channels. Although the current practice is far from the ideal, firms need to consider the impact of customer switching behavior on their profits. In this study, we build a discrete time dynamic programming model to investigate the optimal order fulfillment policies for the retailers using omni-channel implementations (namely, ship-from-store and home delivery). Store customers can be fulfilled in store or they can ask for a home delivery. Online orders, on the other hand, can be shipped either from the fulfillment center or from any other store location that maximizes the overall profit of the retailer. We incorporate the uncertainty both in demand and in the cost of shipment to individual customers. We further consider that both store and online customers can switch across the sales channels. Through computational studies, we compare several scenarios to analyze the impact of offering cross-channel fulfillment implementations and inventory scarcity levels of locations on the retailers' profit.

Keywords

Retail operations, Omni-channel retailing, Ship-from-store, Home-delivery and Dynamic programming.

Biographies

Bahriye Cesaret is an assistant professor at the Faculty of Business at Ozyegin University. She received her B.S. in Industrial Engineering (2008) from Istanbul Technical University, and M.S. in Industrial Engineering (2010) from Koç University. In 2010, she joined the Ph.D. program in Management Science at the University of Texas at Dallas (UTD). During her pursuit of Ph.D., she earned an M.B.A. (2013) and an M.S. degree in Supply Chain Management (2013) from UTD. She completed her Ph.D. in Management Science (with a concentration in Operations Management) in 2015. She received an 'Outstanding Student Teacher Award' from Jindal School of Management for the academic year 2013-2014. She joined Faculty of Business at Ozyegin University in 2015 and served as the Head of Department for Management Information Systems between 2018-2019. Her current research lies in two main streams: Behavioral and Retail Operations Management. She has published research articles in leading operations management journals such as Production and Operations Management, European Journal of Operational Research, Computers & Operations Research.

Armagan Bayram is an assistant professor in the Department of Industrial and Manufacturing Systems Engineering at University of Michigan – Dearborn. She worked as a postdoctoral fellow in the Department of Industrial Engineering and Management Sciences at Northwestern University. She received her Ph.D. in Management Science from the University of Massachusetts Amherst and M.S. and B.S. degrees in Industrial Engineering from Istanbul Technical University. Dr. Bayram's research interests include the development of stochastic models and solution methods for capacity and resource allocation problems. Of particular interest are stochastic optimization and dynamic programming models that involve nonprofit, supply chain and healthcare applications. Dr. Bayram's honors and awards include UM-Dearborn Distinguished Teaching Award (2020), UM-Dearborn CECS Faculty Excellence Award in Teaching (2019), and several Best Paper Awards, including a Finalist Award in the 2013 INFORMS Doing Good with Good OR Paper Competition and an Honorable Mention in 2013 INFORMS Section on Public Programs, Services and Needs Best Paper Award.