Shared Capacity Routing Problem for Buy-Online-Pickup-in-Store Order Fulfillment

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Abstract

Buy-online-pickup-in-store (BOPS) is one of the omnichannel retailing models which is getting popularized nowadays (Gallino & Moreno, 2014; Gallino, Moreno, & Stamatopoulos, 2017; Gao & Su, 2016; Glaeser, Fisher, & Su, 2019; Song,Wang, Liu, & Li, 2020). Motivated by complexities of BOPS environment, we propose a generalized model for the order fulfillment in BOPS retailing to minimize the delivery cost of the BOPS orders. A variant of the problem is characterized by Paul, Agatz, and Savelsbergh (2019) and Paul, Agatz, Spliet, and Koster (2019). Typically, the BOPS orders are delivered at the pick-up-points (PUPs), which are generally the traditional retail stores. The customer can order online and pick up the order from specified PUPs. Big retailers like Walmart and Tesco are using the dedicated warehouse for the fulfillment of the online PUP orders (Delaney-Klinger, Boyer, & Frohlich, 2003; Hübner, Kuhn, & Wollenburg, 2016). The context allows that daily two vehicles visit the stores, one for replenishing the store inventory and the second for delivering the PUP orders. The joint planning of both replenishment and PUP routes is difficult due to operational constraints as replenishment routes are well planned in advanced and PUP routes are planned much later because of the shorter lead time of the PUP orders. However, there are possibilities of exploiting the spare vehicle capacity of the replenishment vehicle, by piggyback the PUP orders on it, so that the total delivery cost of PUP orders is minimized.

Keywords
BOPS, Omnichannel, Transportation, Capacity Sharing, Store transfer

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