Omnichannel B2C Distribution: Modeling Approach and Deployment Scenarios

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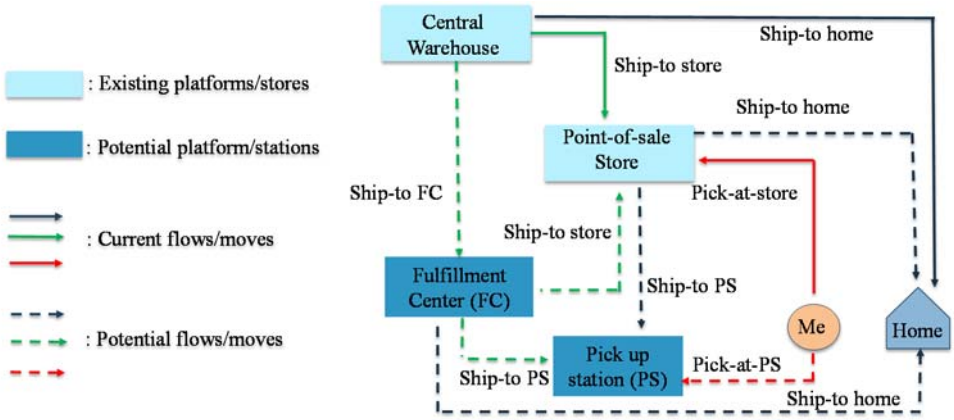
Abstract

Omnichannel business seeks to provide customers with a seamless shopping experience, allowing them to order anytime from anywhere, in person or through digital devices and be delivered at their preferred time and location (Montreuil, 2016). The pursuit of such goal is mainly confronted with city logistics issues aiming to improve last-mile delivery management and pre-position deployment of goods in cities (Crainic and Montreuil, 2016).

Based on the real case of a European retailer, this work deals with the omnichannel B2C distribution problem and presents a modeling approach and deployment strategies under various scenarios. It builds on the fact that the retail sector is nowadays challenged with e-commerce channel expansion, service level expectations, and urban sustainability issues. Thus, the focus of our research is on the reengineering of the current closed distribution network, characterized by disjoint online channel, stores channel and click-and-collect-at-store channel. The Figure below, adapted from Montreuil (2016), provides a generic vision of omnichannel distribution in the city in our studied context. It reflects current innovative logistic organizations, last-mile delivery services, and ship-to/ship-from location options.

Accordingly, a set of alternative deployment strategies, reflected by orders' allocation, inventory positioning, delivery schema and inbound flow patterns decisions, are investigated. The first deployment strategy investigates the ship-from-stores practice where the on-hand inventory is used for all sales channels without any reservation rule. The second deployment strategy investigates the ship-from-stores practice where the on-hand inventory is augmented with an advanced stock level

based on online-sales forecast. The third deployment strategy considers the positioning of a fulfillment center in the peri-urban area where the regular replenishments as well as the online requested orders are transshipped, and where the advanced inventory is also positioned.



To produce good quality solutions, in respect with these deployment strategies, a modeling and optimization approach is employed. It builds on a scenario-based modeling framework including orders' allocation, inventory positioning, delivery and inbound flows patterns decisions, and considering key distribution features such as multi-echelon structure, multiple periods, and uncertainty (Martel and Klibi, 2016). The set of constraints considered here includes maximum delivery time requirements, capacity limits, flows equilibrium constraints and sourcing policy constraints. In addition, a scenario building and generation approach, based on Monte-Carlo method, is employed to characterize the uncertainty in daily orders level and their associated delivery time requests, and the location of consumption points.

An evaluation model is used to assess the performance of the tested deployment options. It mimics with a detailed transportation simulation the daily ordering and customers delivery processes. Results highlight the order of magnitude of the performance gain on delivery service and profitability, by exploiting innovative deployment strategies. To better illustrate the approach we intend to present the case study, the scenarios explored and their performance as well as the managerial insights derived.

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