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ADDING URBAN HUBS IN SUPPLY CHAINS: AN ITALIAN FAST FASHION CASE STUDY

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ABSTRACT

Nowadays, in the fast fashion industry, high delivery frequencies and small lead times are key factors for market competitiveness. To achieve this goal, many companies are evaluating the possibility of opening urban hubs close to the retailers to guarantee more than one replenishment at the retailers each single day. In this paper, we investigate the impact on the service level, inventory investment and transportation costs of adding such hubs in an Italian fast fashion supply chain.

1 INTRODUCTION

The fast fashion industry, nowadays, requires reactive and responsive supply chain. Fast fashion customers demand large assortments and availability of the requested products. From a supply chain perspective, this means either having large inventory levels for each product (Gammelgaard et al. 2016), or having very short lead times and high ordering frequency (Greasley and Assi 2012), especially at the retailer echelon. As retailers are located in the city center, rent out large spaces to have large inventories is quite an expensive alternative, thus usually retailers end up having inevitably less storage space, which force them to optimize their inventory level to feed their customers' requests and minimize costs to remain profitable (Ketzenberg et al. 2000). Thus, the last-mile delivery and the inventory management need to be carefully designed and performed.

To this purpose, possibilities to add urban hubs to the supply chain structure have been studied in the literature (Crainic et al. 2010). From the retailer perspective, a urban hub (with short lead time) may offer buffer storage services to increase the item assortment (Van Rooijen and Quak 2010) and decrease the inventory level for each item in the assortment.

In this paper, the simulation is used to check whether adding urban hubs can improve the performance of an Italian fast fashion company (named as Company in the paper).

2 OBJECTIVE

The problem to be tackled with the simulation is the evaluation of the possibility of adding urban hubs in the Company supply chain to increase the retailer replenishment frequency. Thus, the objective of the simulation is the comparison between the performance of the Company supply chain (i.e., the *as is* scenario) and the performance of the supply chain in case three urban hubs are added in the most critical (from the market standpoint) Italian cities (i.e., the *to be* scenario). The performance measures analyzed through the simulation are: the service level (offered to the final customers), the investment in inventory (of the whole supply chain) and the transportation costs (for the distribution in the whole supply chain).

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3 SIMULATION MODELS

Discrete Event Simulation has been used to replicate the daily inventory planning and allocation processes of the supply chain. The simulation has been developed with the Arena software.
The considered supply chain is composed by one central warehouse (CW) and 200 retailers (located in all the Italian regions), owned by the Company. As the supply chain operates in the fast fashion market, the item assortment and the sold quantities are organized in two main selling season. This simulation replicates one single selling season. At the beginning of the selling season, the retailers receive a *first allocation* quantity from the central warehouse. During the season, if this quantity is not enough to fulfill the demand, the retailers send replenishment orders to the CW. In case the CW cannot fulfill the order, then the order is sent to the other retailers of the supply chain (*horizontal transshipment*). In the *as is* scenario, the retailers send replenishment orders at most once a day and the replenishments have 1 to 3 days of lead time. In the *to be* scenario, three urban hubs are added. Each hub is located just outside the city and keeps a safety stock for each item for the retailers located in that city. The retailers, when needed, send replenishment orders to the urban hubs. The replenishment orders can be sent twice a day. This is possible because the delivery from the hub to the retailers takes few hours. In this way, the retailers can decrease their inventories for each item and increase the seasonal assortment. If the urban hub is not able to satisfy the retailer order, the order is sent first to the CW and, then, to the other retailers (as in the *as is* situation). The urban hubs receive, at the beginning of the season, a first allocation quantity and they do not receive any other quantity during the rest of the season. The *as is* and the *to be* simulation models are developed in a similar way, the only difference is that in the *to be* scenario there is one more echelon to be modelled, whereas the replenishment frequency and lead times are modelled as parameters, thus only their values have to be changed.

The simulation models are composed by three main blocks: the final demand satisfaction, the replenishment demand planning at the retailers, the replenishment delivery to the retailers. In the final demand satisfaction block the customers arrive at the retailers with a stochastic inter-arrival and demand quantity (whose distributions have been fitted from real data given by the Company for each retailer, for each item). If the inventory quantity is enough to fulfill the order, then the inventory is decreased and the order is satisfied, otherwise the customer leaves the retailer with an unsatisfied order. The replenishment demand planning at the retailers block models the issue of the replenishment orders at the retailers. In case the retailer inventory is above a specific safety stock quantity, an order is sent to the supply chain system. In the last replenishment delivery block, the replenishment orders issued by the retailers are fulfilled by the other nodes of the supply chain. If the order has to be fulfilled by another retailer, an optimization algorithm (which is not included in the paper) chooses the best one by matching orders and inventories. In the *to be* scenario, the retailer replenishment order is first checked by the urban hub and, then, by the CW and the other retailers (as in the *as is* scenario). As long as the urban hub has positive inventory, the retailers can issue the replenishment orders twice a day.

During the simulation, data about satisfied and lost final demand, inventory levels and transportations are collected, to obtain, at the end of the simulation, the performance measures listed above in the paper.

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