Dynamic Injection Cutoffs

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ABSTRACT

A method is disclosed, that optimizes a fulfillment operation for e-commerce retailers that deliver orders to final consumers. The method changes the injection and pack cutoffs dynamically in response to day-to-day fluctuations in customer volume. To optimize the fulfillment operation, a dynamic injection cutoff logic is implemented. The pack cutoffs are configured to continually move earlier in a given day, taking into account the total routing mileage for orders due for delivery on that day. A dynamic injection cutoff logic is executed, to calculate the injection cutoff. For an injection cutoff that is within the lock-in injection cutoff, the injection, pack, and order cutoffs are set dynamically. The method is implemented as an application in the server of the online shopping service provider. The method maximizes the availability of a required service level agreement (SLA) such as same day, overnight delivery, etc. for customers while maximizing on-time delivery for retailers.

KEYWORDS: e-commerce, online shopping, fulfillment operation, service level agreement

BACKGROUND

Online shopping services deliver same-day and overnight orders for certain retailers. Various deadlines have to be met by the retailer in order to deliver the ordered product on time to a customer. Each individual retailer store has a pack cutoff, which is the deadline for orders to be packed in order for them to be delivered by the customer requested service-level agreement (SLA) that may be same-day, overnight, 2-day, etc. Two additional cutoffs namely order cutoff and injection cutoff are to be utilized in the fulfillment operation. The order cutoff is the deadline for customers to place orders for a specific SLA that may be same-day, overnight, 2-day etc. The order cutoff is a function of pack cutoff that is typically 1 hour before pack cutoff, but this buffer
can vary. The earlier the order cutoff, the worse the customer experience because that gives customers less time to order for the earliest SLA such as same-day delivery. The injection cutoff is the deadline for parcels to be injected for sortation and routing. Pack cutoff at each store is a function of the set injection cutoff of the sortation facility and the store’s distance from the sortation facility. The later the injection cutoff, the higher is the risk of orders being delivered late. There are two scenarios in which having a static injection or pack cutoff impacts the operation or customer experience. If the set injection cutoff is too late, it may be favorable for customers while placing orders of specific SLA, but the risk of orders being delivered late by the retailers goes up. On the other hand, if injection cutoff is too early, the risk of orders being delivered late decreases but may result in poor customer experience.

**DESCRIPTION**

A method is disclosed, that optimizes a fulfillment operation for e-commerce retailers that deliver orders to the final consumers. The method changes the injection and pack cutoffs dynamically in response to day-to-day fluctuations in customer volume. To optimize the fulfillment operation, a back-end dynamic injection cutoff logic as shown in FIG. 1 is implemented. The pack cutoffs are configured to continually move earlier in a given day, taking into account the total routing mileage for orders due for delivery on that day. The method as shown in FIG.1, includes receiving customer orders placed for various SLAs in step A. In step B, the total route distance ‘y’ for the orders that are due for delivery according to the respective SLA is calculated. The dynamic injection cutoff logic is executed in step C, to calculate the injection cutoff. The injection cutoff logic is a function of several variables: the average amount of time spent on delivery per mile of route ‘x’, total route distance ‘y’, deadline for the orders to be delivered for the day ‘z’, parcel volume ‘a’, average sorting time
per parcel ‘b’, pack cutoff buffer ‘c’ i.e. the average transit time from pickup to injection, and order cutoff buffer ‘d’ i.e. the buffer of time before pack cutoff where customers can no longer place orders for the earliest SLA. The injection cutoff is calculated as \((\bar{z} - \bar{z} - \bar{z})\). The calculated injection cutoff is checked against the current time ‘j’ in step E. If the calculated injection cutoff is within the lock-in injection cutoff, then the injection cutoff is set at \((\bar{z} - \bar{z} - \bar{z})\) in step F. Also the pack cutoff is set at \((\bar{z} - \bar{z} - \bar{z} - \bar{z})\) in step G and the order cutoff at \((\bar{z} - \bar{z} - \bar{z} - \bar{z} - \bar{z})\) in step H. The logic is executed again if the calculated injection cutoff is above the lock-in injection cutoff. The method is implemented as an application in the server of the online shopping service provider. The injection and pack cutoffs are varied dynamically in response to fluctuations in customer volume on a particular day. If the order level is high, the injection cutoff may happen earlier or if the order level is low, the cutoff may happen later. The pack cutoff is varied based on the injection cutoff.

Advantages of the disclosed method are that it maximizes the availability of a required SLA for customers while maximizing on-time delivery for retailers in online shopping services. Further, it allows retailers to change injection and pack cutoffs in response to day-to-day fluctuations in customer volume, thereby better utilizing capacity.
FIG. 1: Dynamic injection cutoff logic to optimize order fulfillment