Collaborative Last Mile Delivery

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Summary: Our study focuses on how to build up the logistics platform that allows horizontal collaboration in last mile delivery. The construction framework includes such steps as identifying a partner, calculating the cost benefits, designing collaborative rules based on the incentives and KPIs for each stakeholder. Our study suggests that selecting the correct delivery areas and having the right partners will help the platform build density and order volume. This will create a reinforcing loop where more orders will generate increased demand for drivers and effectively drive down the delivery cost, thus enhancing the competitiveness of the platform.

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KEY INSIGHTS

1. **Collaborative last mile delivery platform creates value for all stakeholders**
2. **Order density, number of drivers and time window are key factors that influence service level and cost**
3. **Proper gain sharing mechanism help build reinforcing loop**

Introduction

Technology has the potential to transform any industry, and grocery retailing is no exception. Today, grocery retail is being reshaped by digital platforms and it's continuously evolving every year. With technology penetration increasing among the masses, as per the latest Nielson survey, 72 percent of shoppers are expected buy groceries in the future and this jumps to 80 percent for Millennials. This provides a massive opportunity for all the grocery retailers to transform their business to serve the customer's needs.

The advent of mobile phones has accelerated the adoption of online shopping and this has led to an increase in online grocery shopping as well. The customers demand a great online experience combined with a convenient home delivery option. The grocery delivery experience is an integral part of the shopping journey as customers expect on-time, undamaged grocery delivery at a low cost. Retailers must build a solid supply chain and logistics capability to deliver profitable growth in order to meet the ever-growing demands of the modern customer.

Walmart is a leading retailer in the US that seeks to enhance its competitiveness by taking numerous Digital Transformation initiatives. One of the initiatives is the launch of its online grocery platform. Walmart has been offering same-day grocery delivery for its customers in over 1,000 stores and its aggressively expanding to more stores. With 90% of the US population within 15 miles of a Walmart store, it is feasible for the customers' orders to be picked up from the store and delivered to their homes. Walmart has a growing roster of grocery delivery providers that pick up the orders from a nearby Walmart store and deliver it to the customers.

Online grocery adoption is increasing year over year and to support this growth, Walmart is experimenting with its own in-house delivery fleet. One reason for this expansion is to own the delivery experience and

redefine the experience over time. Another reason is to strategically own the logistics component to drive down the delivery costs. Delivery costs are a big component of grocery delivery and its partly paid by customers as grocery delivery fee. Driving down delivery costs has the potential to increase customer ordering frequency due to the law of price elasticity. Providing last mile grocery delivery services from the store to customer's home is expensive and challenging to solve, if it's not tackled correctly. The delivery costs can quickly increase, and get out of control making the home delivery option a risk.

Today when customers shop in Walmart's online store, they are provided an option to enter their delivery Zip Code and reserve a time slot for home delivery. There is variable pricing of $7.99 and $9.99 for different slots based on various factors. The customer reserves a time slot and places an order. Once a certain number of orders have been reserved for a time slot, the time slot disappears for the customers who shop later in the day. There could be instances where two neighbors end up placing orders for different time slots in a day due to non-availability of slots. The store closest to the customer's home address is selected as the store from where the grocery order is fulfilled and delivered. The order is billed, followed by item picking at the store, and finally all the items are consolidated for home delivery. Depending on the number of orders that can be delivered on time, the appropriate number of drivers are dispatched to deliver these orders. A customer order is considered to be delivered on time if the driver reaches the customer's doorstep within the reservation time window.

Building delivery volume is another important feature for the retailer, which brings up the next challenge. Due to small number of drivers, retailer cannot deliver more than its delivery capacity. Having more drivers in its fleet allows the retailer to increase its delivery slots on its website and capture more orders from its customers. If these drivers do not have enough orders to deliver, they would be order-starved and even leave the platform. Capturing more orders and not having enough drivers leads to missed service level agreements (SLA) and poor customer experience. From the above discussions, we understand the benefits of higher number of customer orders and a bigger pool of drivers but customers are required to build a minimum basket size of $50 to avail the home delivery services. This $50 minimum basket limits the number of customers requesting home delivery services and without sufficient volume, it's a challenge to keep the Walmart drivers engaged for delivery tasks.

This research explores the delivery challenges using publicly available datasets to answer the following questions:

a) How can Walmart identify the right delivery markets to extend its delivery services?

b) How can Walmart implement a low-cost grocery delivery while maintaining its current service level?

The first is achieved via a model that extracts demographics for a zip code based on publicly available datasets. The second objective is achieved by proposing a logistics platform that allows horizontal collaboration with other local business partners, such as dry cleaning, bakery to lower the cost to deliver groceries to its customers. We defined a framework to implement a cost-effective platform where the cost benefits are evaluated using simulation. The derived benefits are shared among the partners to drive down the delivery costs. This includes the various steps including identifying a partner, deriving the cost benefits, creating value and others.

This study proposes a framework for collaboration among companies to reduce delivery cost and increase profits which is an effective strategy for small companies to remain competitive against the large companies. In addition, this study also emphasizes the importance of delivery density and the impact of time windows, driver pool and service levels on the overall delivery cost of an order. Simulation is used to calculate delivery costs with density and collaboration. Sensitivity Analysis is performed to demonstrate the cost benefits of collaboration and the impact of time windows, driver pool and service levels on the delivery cost.

Methodology

In this project, we proposed a two-step approach to build a platform that first involves a data driven process to select the right delivery area where there is a high probability for customers to adopt Walmart's grocery delivery. In the next step Walmart collaborates with local partners to provide delivery services for the entire population within the delivery area. This two-step approach helps build delivery density, which is defined as the number of orders delivered within a specific area and time window. This allows drivers to be more efficient by delivering more orders per trip while travelling shorter distance. Delivery density allows drivers to drive for a smaller amount of time, hence allowing to lower delivery costs which can be passed on to the customers.

Four kinds of stakeholders are involved in the platform:

a) Walmart: Walmart is the platform constructor and the governor. Its key responsibilities include platform uptime, availability, scalability and dispute resolution.

b) Business Partners: These are the partners who collaborate with Walmart to deliver value to customers in and around the store. The business partners don't compete with Walmart but instead are benefited from low-cost and reliable home delivery service to its customers.

c) Delivery Drivers: These drivers collaborate with Walmart and its platform. They pick up orders from various locations, and deliver them to customers. The clusters of delivery orders will help drivers deliver more efficiently, and higher order volume will ensure Walmart's in-house drivers have sufficient tasks to keep them motivated on this platform. Economically infeasible orders will be routed to the 3rd party firms.

d) End Customers: These are the customers who avail delivery services from Walmart and the partners. Initially it comprises of the Walmart's Grocery customers but over time Walmart's other divisions like pharmacy, general merchandise, etc. could start leveraging this platform. In parallel once the business partners are identified, their customers will also be served by the platform. Customer specific information will not be stored or shared on the platform except pickup and drop-off locations.

Figure 1 identifies the stakeholders on the platform and their relationship.

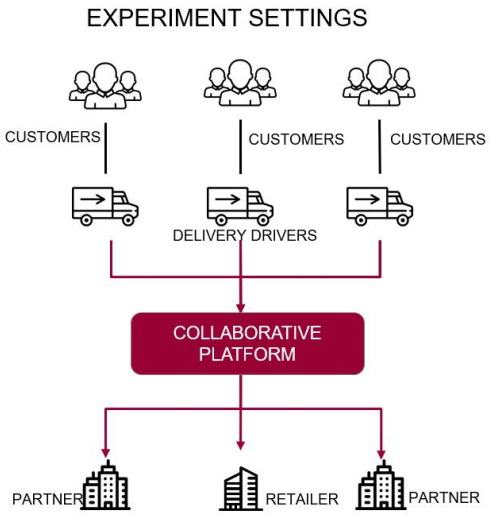

Figure 1 Collaborative Delivery Platform

We proposed a collaborative model that each Walmart store forms partnerships with local businesses to increase order volume and to drive down delivery costs. Walmart's non-competitors are invited to collaborate and join the last mile logistics platform. The business partners take orders from their customers either online or phone and they request a pickup and delivery service through the platform.

The core value proposition offered by the collaboration is to provide partners on-demand delivery services at competitive price. The other benefits include allowing easier response to demand fluctuations, improvement in service levels and new market expansion. The process of identification and collaborating with a partner from pilot to a full go live is broken down into four high level phases as shown in Figure 2.

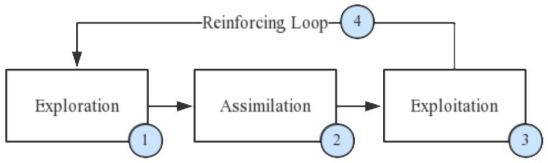

Figure 2 Collaboration High Level Process

In the Exploration phase, the right partners are identified who prioritize the value proposition offered by the logistics platform. At the end of this phase, the KPI are reviewed, contracts negotiated and a pilot is completed with the partner. Assimilation is the phase where learnings and new information from the pilot are shared with the platform. From the learnings, the process is tweaked through active communication which goes back as feedback to benefit the platform. This phase can bring in new benefits to both the platform and the business partner which leads to large benefits during the Exploitation phase. Exploitation is the final phase where the real benefits are generated including lower delivery costs, higher service level agreements and easier response to demand fluctuations.

Result

Sensitivity analysis was performed to demonstrate the impact of delivery density, time windows, number of drivers and the delivery costs. This helps us to validate our assumptions of using the right metrics to incentivize the partners. The analysis was targeted towards three variables namely Density, Time Windows and number of deliveries.

The upper left chart in Figure 3 illustrates the impact of density on the delivery while the remaining parameters (service area, time windows, driver count, pickup time and doorstep time) are kept constant. The time window is set to 2 hours, number of drivers is set to 5, pickup time is set to 5 minutes, doorstep time at drop off location is set to10 minutes and the delivery area is contained within a radius of 3 miles. It can be seen that as the number of delivery orders within a service area increase, the cost to deliver these orders decrease which is due to the smaller amount of time spent by the driver delivering these orders.

The upper right chart in Figure 4 explains the impact of time windows and service level, when the service area and the order volume are kept constant. Service level is defined as the number of orders delivered within a specific time window time. First, we see that a larger time window provides a higher service level to customers. On one hand, Walmart has to incentivize the partners and educate them on the importance of larger time windows on service level. On the other hand, Walmart should also focus on onboarding business partners that serve customers with a larger time window.

The lower left chart in Figure 4 explains the impact of time windows and vehicle count, when the service area and the order volume are kept constant. Vehicle count and drivers have a one to one correlation as one driver drives one vehicle. We see that a larger time window reduces the number of vehicles required to service all the customers. This is an important learning because the platform can also provide delivery services to new delivery areas where there is driver shortage provided the delivery windows are kept longer.

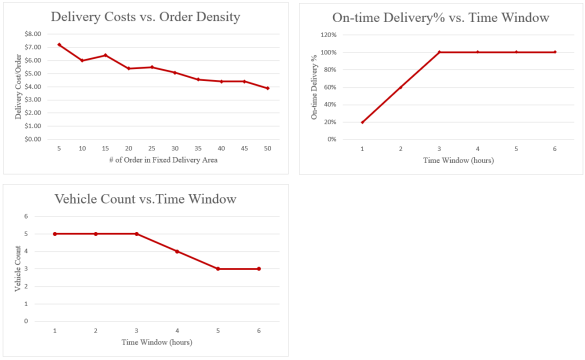

Figure 3 Sensitivity Analysis Result

From the sensitivity analysis we see an opportunity to drive down the delivery costs further down and pass the benefits to the customers. Walmart should incentivize partners to bring more volume onto the platform to drive costs down due to economies of scale. There should be higher incentives for partners who are able to bring more orders within a smaller radius for a given day and time window.

Conclusion

In this research, we considered how Walmart can selectively invite partners to its logistics platform to collaborate and create value for all the stakeholders. The value proposition behind this collaboration is to drive down delivery costs while increasing the customer service levels and to smoothly handle demand variations. Based on the research we want to share the following insights:

a) Density - Identifying partners who can drive up volume is a key requirement for the platform

b) Driver Engagement - Drivers should be motivated and incentivized to work on this platform.

c) Time Windows - Partners should be prioritized based on their flexibility to allow longer time windows. Orders with a larger time window will allow the platform to build dense routes.

Based on the simulation, we were able to calculate delivery costs that will allow Walmart to reduce its current delivery charged published on its website. A lower delivery charge will allow more customers to use the delivery service. This will also allow the partners who are small businesses to compete against the larger businesses by offering reliable delivery services to its customers at competitive rates.

In this study, we saw reduction in overall driving time which means lesser CO2 emissions and benefits to the environment. Quantifying the benefits of environment impact are outside the scope of this study but will be proposed as a recommendation for future research.