Ship-Pack Optimization to Minimize Fulfillment Costs from Manufacturing to Customer

ResMed

BUSINESS PROBLEM

The motivation for this project is to reduce operational expenses, distribution center complexities, and improve customer satisfaction by aligning manufacturing and distribution efforts with customer needs. This thesis centers around the potential of ship-pack optimization to minimize costs across the distribution chain.

APPROACH

Through conversations with "ResMedians" and external partners from manufacturing to customer service and by analyzing ResMed's past year fulfillment of 2M customer orders for 80M products, the project developed a model for case-pack optimization. The optimization model uses costs from labor, shipping, customer call to serve, and packaging. The decision variable is the ship-pack quantity for a SKU.

DATA SOURCES

The primary data source is held in ResMed's cloud service and includes customer order numbers, customers, shipping zip codes, number of SKUs, time between ordering and shipment, and revenue. Other sources include excel sheets containing packaging configurations for each SKU and customer complaint data tied to each customer order.

Data Types and Format

Customer order data is held in tables in ResMed's cloud service or excel. Site visits, interviews, and time series studies were generated manually and refined in Microsoft Office tools.

Input Variables
1. Customer orders
2. Distribution labor costs
3. Distribution box costs
4. Manufacturing box costs
5. Distribution to customer shipping costs
6. Average customer complaint cost-to-serve

Decision Variable
SKU case-pack size

Objective
Minimize total business costs

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IMPACT

The optimized ship-pack cost-to-fulfill model finds that ResMed can save over 5% or over $2M dollars, by optimizing ship-pack quantities. The bulk of this cost savings is in minimizing multiple shipments of product and reducing labor costs at the distribution centers. Interestingly, some SKUs increase in ship-pack quantity, while some SKUs decrease in ship-pack quantity. This is expected, as there is a balance between larger packages saving costs at the manufacturing site, and reducing the freight base costs, but incurring larger costs due to distribution center handling. An additional study was conducted using the cost-to-fulfill model. This study analyzed customer ordering behaviors and sought to identify operational cost savings by influencing customer behavior. This motivation led to the creation of a secondary model; the optimized ordering cadence cost-to-fulfill. ResMed stands to gain operational savings of over 9% or over $4M dollars if all customers were to move to a weekly ordering cadence.

DRIVERS

The project charter was to identify opportunities within ResMed Commercial Operations to: 1. Increase customer satisfaction 2. Reduce ResMed costs 3. Increase revenues. Through conversations with "ResMedians" across Operations, Customer Service, Distribution, Finance, Logistics, Manufacturing, Marketing, Product Engineering, Pricing and by analyzing ResMed's past year fulfillment of 2M customer orders, case-optimization became a clear solution.

BARRIERS

Barriers that impacted the project mostly focused on the lack of data tied to shipping. There does not exist a way to tie individual orders to freight terms. Therefore, generalizations were made on the averaging of freight costs. These estimates were validated as the model was matched to known freight costs for the fiscal year.

ENABLERS

The culture at ResMed and continued appetite for data was a major enabler. The Commercial Operations team, led by Anthony Vargas, was always willing to lend information, share their network, or provide a brain-storming session to solve problems. Additionally, ResMed's external partners were key enablers to understanding the entire distribution chain.

ACTIONS

The results and approach of this thesis was presented to senior leaders within ResMed. The results found a receptive audience. ResMed is actively looking for opportunities to optimize customer ordering behaviors. The results of this internship on current operations remains to be seen.

INNOVATION

The cost-to-fulfill model created in this thesis is novel to literature. The model is capable of recommending ship-pack changes based on manufacturing packaging costs, transportation costs, handling costs, distribution packaging costs, and customer complaint costs for real-world demand. This model, unlike most in this area of research, is unique to a company primarily operating as a distributor of their product, rather than a two-echelon system.

IMPROVEMENT

The optimized ship-pack cost-to-fulfill model finds that ResMed can save over 5% or over $2M dollars, by optimizing ship-pack quantities. ResMed stands to gain operational savings of over 9% or over $4M dollars if all customers were to move to a weekly ordering cadence. The bulk of this cost savings is in minimizing multiple shipments of product and reducing labor costs at the distribution centers.

BEST PRACTICES

Someone who would like to replicate this solution must engage the entire distribution chain. This includes but is not limited to Commercial Operations, Customer Service, Distribution, Finance, Logistics, Manufacturing, Marketing, Product Engineering, and Pricing. Additionally, any solution will require access to real-world customer ordering data.

OTHER APPLICATIONS

This solution can be generalized to any distribution chain for a supplier of product that is shipping multiple items in one packaging solution. This thesis is of special interest to suppliers who see a mismatch between case pack quantities at their manufacturing site and customer's typical order quantities.