**Swirltubs after Market Product Inventory and Service**

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**Case Study Part 5**

**Executive Summary:**

Swirltubs, a company that produces electrical appliances such as washers, dryers, etc., offers an after-market warranty service and repairs to appliances within the warranty period. The company wants to minimize its total costs through stocking parts on its service vans, such that the repairs are done on the first visit to the customer, thus maintaining or improving customer satisfaction. After re-optimizing 50 replications to account for different levels of random demand, we found that the final stock recommendation has a 59% match with the original stock recommendation. Our final recommendation is to stock 185 parts in total, with demand confidence ranging from 100% to 40%.

**Business Background:**

Swirltubs is a company that produces electrical appliances such as washers, dryers, dishwashers, refrigerators and stoves, among other products. The company offers after-market warranty service and repairs to its customers when their appliance has a problem during the warranty period. This service is managed by the Director of Aftermarket Logistics, Jim Jenkins, who oversees the inventory levels of parts, customer service and technicians.

**Problem Background & Problem Statement:**

Swirltubs is interested in reducing the costs incurred in its after-market warranty service program through stocking parts in the technicians’ vans while ensuring minimum costs. A holding cost is incurred if a part is stocked on the van, and a revisit cost, if not. The company wants to identify which parts to stock while adhering to the van space constraint of 500 cubic feet. Jim is interested in evaluating the robustness of the recommendation under different levels of uncertain demand.

**Data:**

The test data for a typical technician’s parts needs for the past year is given, consistent with 80% of their annual repairs, while excluding the rarely used and outdated parts. There are 416 parts, each with the average number of uses in the year, part size (in cubic feet), and part cost.

**Assumptions/Scope:**

* Each van can accommodate parts up to 500 cubic meters.
* The cost of holding is 25% of the part’s cost.
* Technicians work 250 days a year or 50 weeks per year, and their time is $50 per hour.
* Revisit cost is half an hour of the technician’s time, i.e., $25 times the average annual use of part.
* There are 416 parts typically used 80% of the time by technicians annually which are smallest, lowest cost and most used that Jim feels are the best to carry.
* Delivery time of any part is 5 business days.

**Method/Approach:**

* We account for different levels of random demand using a binomial distribution. We then compute the Net Benefit per Cubic Foot for each part, and sort it in descending order. The parts are stocked until the remaining space in the van becomes negative.
* We replicate the randomization 50 times, reoptimizing to get a new stocking recommendation each time.
* We find the frequency of each part within the 50 replications and order them in the decreasing order of frequency. This is our new stock recommendation.
* We then compare it to the original recommendation and infer that 41% of the 185 parts in the new recommendation don’t match with the original recommendation.
* Fig. 1. displays the percentage match and the difference between the new and original recommendation.
* Fig. 2. displays the number of parts with their respective confidence percentage of being stocked. We see that there are only 26 parts having an 80% confidence and above of being stocked.
* We have completed the analysis of the problem in Excel.

Fig. 1. Percentage Difference between Recommendations

Fig. 2. Confidence % of Stocked Parts

**Results:**

After 50 replications, we found that the new recommendation consisting of 185 parts, occupies more space (498.45) as compared to the original (497.50), which consists of 158 parts. Also, out of 185 parts, 59% of the parts match with the original recommendation, and 41% don’t, when accounting for different levels of random demand.

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**Recommendations:**

Our final recommendation would be to stock the 185 parts in each van as per the new stocking strategy, as it accounts for different levels of random demand. This recommendation also ensures more space is used, while keeping costs at a minimum and ensuring the van constraint of 500 cubic feet.

**Risks:**

We’re using historical data to plan for future events, which can be different despite our randomization efforts. However, these efforts do get us closer to the real world result.