MFTBC CS Data Scientist Hiring – Case Study Problem

Vidya was looking at the report that receives about the stocks in the stores in the region she manages. She again found that fill rates are not 100% for various SKUs in stores across the region. She had tried to increase this based on the reports she had received earlier, by increasing stocks for such SKUs at the Distribution Center (DC). But the problem remained. She had to think of something quickly otherwise stock out costs were gradually increasing for the company leading to customer dissatisfaction.

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ABC is a multinational retail company that runs stores across countries with an annual retail revenue of $10 billion. It is looking at expanding itself in India and in such a such a situation, lower fill rates (percentage of customer orders satisfied from stock at hand) at its stores leading to customer dissatisfaction do not augment its growth plans and strategy. Its stores are divided into Hyper, Super and Departmental stores. These stores have been located such that they are able to cater to locations across region based on demographics and economic factors. They source products directly from individual vendors as well as the company's distribution centers (DCs). The DCs also source from either individual vendors or from Master Distribution Centers. Based on the stocks present in the store, the store manager raises orders following the order raising process and sends it for fulfilment. The orders are then processed either by individual vendors (direct procurement) or by the DCs. The order fulfilment has a lead time that varies based on where the SKU is being sourced from. The stores have a demand forecasting method which gives them an accuracy of 65-70% resulting in demand variance. These factors, among a few, cause the order quantities to result in sub optimal fill rate.

Vidya is the region's procurement manager and in essence has to see to it that there is a 100% fill rate at the stores. She works with the store managers to fine tune their demand forecasting such that order quantities follow science along with experience. She also vets products that are directly procured by the stores instead of sourcing from the DCs. She works with the DC managers to smoothen the process of order fulfilment from the stores. This includes seeing to it that orders are fulfilled while reducing the lead time.

Rajesh has usually seen that the fill rate in the stores hovers around 97% but off late she found that the fill rates have fallen to around 80% (at times lesser than this in a few stores).

1. What does Vidya need to do to understand the lower fill rates and improve them?

As a first step Vidya decided to gather data to understand where things were going wrong. She contacted the store managers and requested data on their available stock, stock transfer schedules, the fill rate, sales value averages and actual sales. She asked this from all the six stores which were being catered to by Kolkata Metropolitan Area DC and for each of the 5 SKUs they sold from May

onwards. She wanted to see how these data points were moving in order to understand customer requirements later.

Please refer to Data.xlsx (Store View Sheet) for the details she obtained.

She was aware that the data capture system was not the best at the stores and many of the data points could be based on the store manager's experience and might need to be adjusted based on logical assumptions.

As a next step she gathered data from DC. Since fill rates at the stores were low, he wanted to understand whether the DC had stocks or was it itself the root cause. She also gathered the times it took to transfer stocks from the DCs to the stores and in between stores too. This was because Vidya was aware that the fulfilment trucks many a times started from the DC and went about fulfilling the orders across the stores rather than doing a one on one trip. This was done to reduce costs.

Please refer to Data.xlsx ('DC View' and 'Lead Time' sheets) for the details she obtained.

Since she did not have any say over the individual vendors from whom the DC/stores could do a direct procurement, she could not gather data on them. But she was aware that problems with them, if any, could be solved easily by pushing vendors using their superior buying power.

With this data in hand, Vidya set about trying to understand the low fill rates. She had just one objective in mind – increase fill rates at the stores, but she was overwhelmed by the data that she had obtained. She not only had to understand the data but also had to analyze it in order to come up with strategic insights that could be translated on ground for the DCs and stores. Along with this regular work, this seemed a daunting task and she felt that it would be more effective to call in data scientists to understand the data and get advice on improving fill rate at stores.

How can Vidya be helped to understand the data better and derive strategic insights form it to answer his problem?

Vidya is expecting:

1. A clear and easy understanding of the data she has acquired.
2. Hidden insights that can be derived statistically from the data which he can use to solve his problem.
3. Recommendations and way forward for increasing fill rate.

Please indicate all assumptions with logic.

Glossary

Term	Definition
SKU	A stock keeping unit (SKU) is a store's or catalog's product and service identifier that helps the item to be tracked for inventory. It is the smallest unit of merchandise for the case consideration.
Store	Physical retail outlets - 6 in total.
Distribution Centre/Supply Site	A single centralized warehouse responsible for issuing Purchase Orders to 3rd party vendors, goods receipt and distribution to the 6 stores.
Lead Time (Store View Tab)	This is the 'Actual' time taken for an SKU to be delivered to a Store from the DC on a specific date
Vendor Lead Time (VLT) (DC View Tab)	This is the 'Contractual' agreed upon time for an 3rd party vendor to deliver an SKU to the DC
Lead Time (Lead Time Tab)	These are standard/target lead times for transferring goods from the DC to individual stores and between stores
UoM	Unit of Measure for SKU
Retail Price	Price for a single unit (in UOM terms) for an SKU - e.g. Vintage 12 Yr Old 700ml @ INR 1,160. It is same across all Stores on all dates.
<Name of Metric M> last <Time Period T> - Rolling Average	Average of the metric M over the previous T Weeks/Months/as specified counted from the System Date
PO	Purchase Order - A purchase order (PO) is a commercial document issued by a buyer to a seller, indicating types, quantities, and agreed prices for products or services.
STO	Stock Transfer Order - It is a document issued by a receiving site (Store) to an supplying site (DC) for the movement of goods
GRN	A goods receipt note (GRN) is created to record the delivery of items from suppliers. A GRN is created against an issued purchase.
Fill Rate at Store	Percentage of customer or consumption orders satisfied from stock at hand. It is a measure of a store inventory's ability to meet demand.
PO Fill Rate	Percentage of PO Quantity Raised by the company to external vendors that has been received at the DC (GRN Quantity). Hence PO Qty/GRN Qty at DC.